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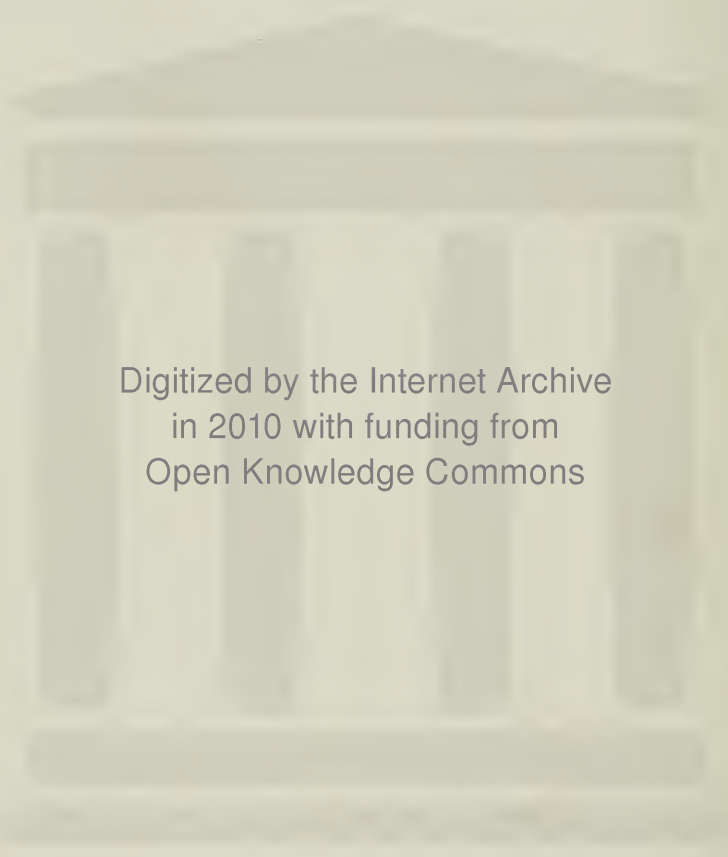
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THE AFTER-TREATMENT
OF SURGICAL PATIENTS

VOL. II



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THE AFTER-TREATMENT
OF
SURGICAL PATIENTS

BY
WILLARD BARTLETT, A.M., M.D., F.A.C.S.
AND
COLLABORATORS

VOL. II

*WITH TWO HUNDRED THIRTEEN ORIGINAL
ILLUSTRATIONS*

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CONTENTS

VOL. II

CHAPTER LXIII

FACE AND CRANIUM (BY ELLIS FISCHELL)	675
Face, 675; Wounds of the Forehead, 675; Wounds of the Cheek, 676; Wounds of the Nose, 676; Wounds of the Lips, 676; Wounds of the Chin, 676; Complications, 677; Special Operations, 678; Upper Jaw, 678; Lower Jaw, 678; Oral Cavity, 678; Temporomandibular Joint, 679; Harelips, 680; Cleft Palate, 681; Cranium, 681; Surgically Clean Wounds, 682; Sebaceous Cysts, 683; Exploration of Hematoma, 683; Decompression Operations, 683; Plastic Flaps from the Scalp, 683; Osteoplastic Flaps, 684; Operations for Repair of Defects, 684; Surgically Unclean Wounds.—Operations Through an Infected Field, 684; Operations for Brain Abscess, 685; Operations for Meningitis, 685; Operations for the Removal of Sequestra, 685; Complications, 685; Hemorrhage, 686; Shock, 686; Respiratory Failure, 686; Hernia Cerebri, 687.	

CHAPTER LXIV

OPERATIONS UPON THE NECK (BY WILLARD BARTLETT)	688
Furuncles, 688; Carbuncles, 689; Tracheotomy, 691; Ligation of Thyroid Vessels, 694; Thyroidectomy, 695; Neck Gland Dissection, 709; Laryngectomy, 711.	

CHAPTER LXV

OPERATIONS UPON THE THORAX (BY WILLARD BARTLETT)	713
Abscess of the Breast, 713; Benign Breast Tumors, 718; Malignant Tumors, 724; Empyema, 732; Chronic Pneumothorax, 745.	

CHAPTER LXVI

SURGERY OF THE ABDOMEN (BY WILLARD BARTLETT)	748
Abdominal Wall, 748; Inguinal Hernia, 752; Umbilical Hernia, 758.	

CHAPTER LXVII

INCISIONAL VENTRAL HERNIA (BY WILLARD BARTLETT)	761
Etiology, 761; Symptoms, 765; Treatment, 766.	

CHAPTER LXVIII

THE PERITONEUM (BY WILLARD BARTLETT)	781
Hydrops, 781; Peritonitis, 781; Encapsulated Peritonitis, 789; Chronic Peritonitis, 789.	

CHAPTER LXIX

THE STOMACH IN GENERAL (BY WILLARD BARTLETT)	792
Ulcer of the Stomach, 800; Cancer of the Stomach, 805.	

CHAPTER LXX

THE INTESTINES (BY WILLARD BARTLETT)	810
--	-----

CHAPTER LXXI

THE LIVER (BY WILLARD BARTLETT)	826
Abscess, 826.	

CHAPTER LXXII

THE GALL BLADDER AND DUCTS (BY WILLARD BARTLETT)	832
--	-----

CHAPTER LXXIII

APPENDICITIS (BY WILLARD BARTLETT)	851
--	-----

CHAPTER LXXIV

THE PANCREAS (BY WILLARD BARTLETT)	861
Total Extirpation, 861; Prolapse, 861; Injury, 863; Acute Pancreatitis, 863; Subacute Pancreatitis, 864; Chronic Pancreatitis, 864; Cancer, 866; Cyst, 866.	

CHAPTER LXXV

THE SPLEEN (BY WILLARD BARTLETT)	868
--	-----

CHAPTER LXXVI

THE PELVIC ORGANS OF THE FEMALE (BY WILLARD BARTLETT)	873
The Ovaries, 873; The Fallopian Tubes, 881; The Uterus, 888.	

CHAPTER LXXVII

THE POSTOPERATIVE TREATMENT OF UROLOGIC CONDITIONS (BY JOHN R. CAULK AND HARRY G. GREDITZER)	899
Sedatives, 900; Injuries of the Penis, 902; Circumcision, 902, Hypospadias and Epispadias, 903; Amputation, 903; Injuries of the Urethra, 903; Urethrotomy, 903; Injuries of the Scrotum, 905; Suprapubic Prostatectomy, 905; Perineal Prostatectomy, 908; Injuries of the Bladder, 909; Trigonitis or Trigonal Hyperemia, 909; Litholapaxy, 909; Suprapubic Lithotomy, 910; Cystotomy, 910; Injuries to the Ureter, 910; Injuries of the Kidney, 911; Pyelotomy, 911; Nephropexy, 911; Nephrotomy, 912; Nephrectomy, 912.	

CHAPTER LXXVIII

POSTOPERATIVE TREATMENT OF RECTAL AND ANAL LESIONS (BY FRANCIS REDER)	914
Hemorrhoids, 916; Fistula in Ano, 922; Fissure of Anus, 924; Anal Papilloma, 925; Pruritus Ani, 926; Ischiorectal Abscess, 927; Prolapse	

of Rectum, 928; Stricture of the Rectum, 930; Excision of Rectum, 931; Rectovesical Fistula, 939; Rectovaginal Fistula, 940; Complete Tear of the External Sphincter Ani, 941.

CHAPTER LXXIX

THE AFTER-TREATMENT OF OBSTETRIC AND VAGINAL OPERATIONS (By W. H. VOGT)	942
General Consideration, 942; Nutrition, 943; The Care of the Bowels, 944; Control of Pain, 944; Changing of Dressing, 945; Thrombosis and Embolism, 945; Cystitis, 947; Catheterization, 949; Induction of Abortion and Premature Labor, 951; Hydatidiform Mole, 952; Forceps Deliveries—Versions—Destructive Operations, 952; Care of the Nipples, 957; The Conduct of the Puerperium in General, 958; The Binder, 958; After-Pains, 959; Rest and Sleep, 959; Time of Getting Up, 959; Final Examination, 959; Reappearance of Menstruation, 960; Puerperal Wounds, 960; Lochia, 960; The After-care of Perineal Lacerations and Episiotomy Wounds, 961; Cesarean Section, 963; Vaginal Cesarean Section, 969; Hebosteotomy (Pubiotomy), 969; Vesico-vaginal Fistulae 970; Postpartum and Postoperative Hemorrhage, 971; The After-care of Plastic Operations, 975; Diet, 975; Bowels, 976; Removal of Sutures, 976; Infection, 976; Rest, 977; After-care of Complete Perineal Tears, 978; Vesico-vaginal Fistula, 978; Vaginal Hysterectomy, 979; Hemorrhage after Operation, 979; Pelvic Abscess, 979.	

CHAPTER LXXX

SURGERY OF THE EXTREMITIES (By WILLARD BARTLETT AND W. H. COLE)	981
Amputation, 981; Routine for Aseptic Amputation, 981; Bandaging, 981; Immobilization, 981; Massage, 981; Pressure Exercise, 981; Movements, 982; Hydrotherapy, 983; Encouragement, 983; Affections and Complications: Their Treatment, 983; Painful Stumps, 984; Sinuses, 984; Ulceration, 985; Bad Scars, 985; Joint Contractures, 986; Gangrene, 986; Diabetic, 986; Senile, 986; Surgery of the Bone, 986; Compound Fractures Treated by Operative Methods, 986; Primary Closure, 986; Suppurating Cases, 989; Ununited Fractures, 990; Affections of the Joints, 990; Syphilis and Tuberculosis, 991; Osteomyelitis, 991; Acute Form, 992; Chronic Form, 993; Bone Grafting, 993; Indications for Grafting, 994; General Principles Underlying the Operation, 994; Infections, 995; Stages of Infection, 995; Methods of Treatment, 995; Closure of the Wound, 1000; Tetanus, 1000; Infection with Gas Bacillus, 1001; Peripheral Nerve Injuries, 1002; Symptoms, 1002; Operative Procedures, 1004; After-Treatment, 1005; Varicose Veins, 1006; Skin Grafting, 1008; General Principles, 1009; Methods of Operation, 1008; After-Treatment, 1009.	

CHAPTER LXXXI

POSTOPERATIVE TREATMENT OF ORTHOPEDIC PATIENTS (By M. S. HENDERSON)	1011
Pain, 1011; Complications, 1012; Diet and Medication, 1012; Fresh Air and Hygiene, 1013; Fixation, 1013; Physiotherapy, 1020; Fractures,	

1020; Fracture of the Tibia, 1021; Pott's Fracture, 1022; Fracture of the Shaft of the Femur, 1023; Fracture of the Neck of the Femur, 1024; Fracture of the Humerus, 1025; Fracture of the Forearm—Radius and Ulna, 1027; Excision of the Knee Joint, 1027; Arthrodesis of the Hip Joint, 1028; Arthroplasty of the Hip Joint, 1028; Arthroplasty of the Elbow, 1029; Purulent Arthritis, 1030; Osteomyelitis, 1031; Malignant Disease of Bones, 1031; Bow Legs and Knock Knees, 1032; Congenital Dislocation of the Hip, 1032; Coxa Vara, 1032; Club Foot, 1033; Hallux Valgus, 1033; Lamé or Stiff Shoulder and Subdeltoid Bursitis, 1033; Recurrent Dislocation of the Shoulder, 1034; Excision of the Shoulder Joint, 1035; Congenital Torticollis, 1036; Tuberculosis of the Spine, 1036; Psoas Abscesses, 1037; Tendon Transference, 1037; Recurrent Dislocations of the Patella, 1039; Derangements of the Knee Joint, 1039; Flat Foot, 1039.

ILLUSTRATIONS

FIG.	PAGE
222. Breathing tube to be used following harelip operations	689
223. Emergency tracheal tube, made of rubber tubing	692
224. The patient in bed on the face, immediately after goiter operation	696
225. The goiter patient inhaling steam soon after operation	697
226. The apparatus by means of which steam is generated	698
227. Strip of folded rubber laid across the defect in the thyroid gland	699
228. Reuniting the cross cut in the ribbon muscles over the drain	699
229. Reuniting the ribbon muscles in midline	700
230. Position of through-and-through drain compared with that of the older type of midline drain	700
231. End of drain pulled out and cut off in such a manner that exposed por- tion is never drawn into the wound	701
232. Drain removed after one exposed end has been cut off	701
233. The neck as it appears a few hours after the drain has been removed	702
234. Side view of neck after drain has been removed	702
235. Puncturing a bleb with wooden toothpick as done at the Mayo Clinic	703
236. Puncturing a bleb with sharp-pointed forceps	704
237. A collection of serum after thyroidectomy	704
238. Same neck as shown in Fig. 237, after glycerine pack has been applied overnight	705
239-241. Incisions for neck gland dissection	709
242. Two short incisions radiating from the nipples are made at the periph- ery of the abscess	714
243. A forceps thrust into one incision, through the cavity, and out the other	714
244. A strip of folded rubber drawn into wound	715
245. Ends of the rubber fastened together so that it can not slip out	715
246. Method of fastening ends of drain together with safety pin	716
247. Ends of the tube freed for removal	717
248. Strands of silkworm attached to the end of the tube and will be drawn in as the other end of the tube is drawn out	717
249. The silkworm strands in place to take care of serous drainage	718
250. The ends of the bundle crossed and cut off short after they have been tied together at several points	719
251. Rough bundle wrapped with adhesive to protect the patient's skin	719
252. The completed drain	720
253. Instead of silkworm a few strands of heavy silk drawn in and tied separately	721
254. Silk strands removed separately	721
255. The primary semicircular incision beneath the breast	722
256. Removal of gland substance with the cantery	723
257. Marking line of intended incision	723
258. The fat transplant in its new position	724
259. The drain in place in the axillary space	725

FIG.	PAGE
260. The drain emerges through a stab wound in the posterior axillary line	726
261. Triangular flaps saved by letting venous blood out through small stab wounds	727
262. A granulation tissue, surface protected by rubber tissue from gauze dressings while being prepared for secondary skin graft . . .	728
263. A form of breast dressing which allows the affected arm perfect freedom of motion	729
264. A towel bandage which fixes a breast dressing and allows the arm entire freedom	730
265. Amount of movement which must be given the affected arm on the various postoperative days	731
266. A form of bilateral exercise to insure using the shoulder joint of the affected side	731
267. Infiltration of the chest wall about the rib or interspace to be utilized	733
268. Drilling through a rib for the introduction of a drainage tube . . .	733
269. Biting out a groove for the tube	734
270. Attaching the tube by a silk suture around the rib	734
271. A trochar and cannula for introducing tube through intercostal space	735
272. The two curves indicated by dotted lines mark the most dependent drainage point when the patient lies down	736
273. The cannula introduced at the intersection of curves and trochar withdrawn	737
274. Rubber tube inserted through cannula	737
275. Tube held in place and cannula withdrawn	738
276. Tube held in place by safety pin passed through the skin	738
277. Brewer's empyema drainage tube	739
278. Brewer's empyema drainage tube	739
279. A convenient form of resistance against which the patient may blow .	740
280. Blood pressure apparatus and rubber ring transformed into a resistance apparatus	741
281. Showing bottle and lower end of drainage tube covered by an antiseptic solution	742
282. Clamping tube while bottle is being emptied. Drainage apparatus in place	743
283. Patient sitting up with drainage apparatus in place	744
284. Trap door made in chest wall by removing segments of four ribs . .	746
285. Double tension sutures tied over pads of gauze to either side of the incision	749
286. Free ends of tension sutures tied over separate pads of gauze	749
287. Tension sutures reinforcing mattress skin sutures	750
288. Tension strips of adhesive buttonholed to allow escape of discharge .	750
289. An ordinary supporting bandage for the abdomen	751
290. The Gellhorn apparatus for applying heliotherapy to an undressed abdominal wound	751
291. The broken position which takes a tension off sutures in inguinal region	753
292. Patient on side in broken position	753
293. Broken position at a late period in convalescence	753

FIG.	PAGE
294. A convenient dressing for those who insist on using one in inguinal hernia	754
295. A pad of gauze supports the scrotum and contents	754
296. A T-binder holds the pad in place	755
297. Commercial suspensory in place. Application of collodion to an inguinal hernia wound	756
298. Circumcising old scar	767
299. Dissecting skin scar away from sac	768
300. The sac freely exposed	769
301. The sac pushed in, demonstrating ring	770
302. The sac inverted, edges of ring being sutured together over it	771
303. Redundant sac being removed previous to overlapping of resistant tissues	772
304. First step of overlapping one free edge sutured underneath opposite segment of wall	773
305. Second step of overlapping	774
306. Excising fascia lata flap	775
307. Suturing fascia lata flap in place	776
308. Closing dead space in subcutaneous fat	777
309. Suture of skin	778
310. The paraphernalia employed in stomach lavage	793
311. A nonbreakable can	794
312. Two types of stomach tube commonly employed	794
313. Patient ready for lavage, with adequate protection for surroundings .	795
314. The tube in position for emptying the stomach	796
315. Patient holds the tube in place and a water trap is maintained in raising and lowering it so that air is not sucked into the stomach .	797
316. The incision in the anterior wall of the stomach allowing access to the gastroenterostomy opening in the posterior wall	798
317. Introduction of a Murphy button	798
318. Opening fascia and peritoneum in making drainage fistula	814
319. Attaching the bowel to fascia and peritoneum before opening	814
320. A drainage tube split at its inner end	815
321. The drainage tube held in forceps and ready for introduction	815
322. Bowel held open with forceps while tube is being introduced	816
323. The tube anchored in the bowel	816
324. Tube passing through abdominal incision and the omentum into the lumen of the bowel	817
325. End of tube shown in bowel	817
326. The artificial anus resulting from two stage colon resection, showing the spur	818
327. The artificial anus freed from surrounding tissues	818
328. The connective tissue ring trimmed away	819
329. Transverse suture of submucosa	819
330. Transverse suture of intestinal wall after bowel edge has been inverted	820
331. Longitudinal suture of skin with reinforcement and drainage	820
332 and 333. Method of creating artificial anus	821
334. Method of creating artificial anus	822
335. Method of creating artificial anus	823

FIG.	PAGE
336. Method of creating artificial anus	824
337. Method of creating artificial anus	824
338. Gall bladder drain tube	833
339. Self-inverting suture introduced into the gall bladder	833
340. The tube pushed down while circular suture is held up	834
341. Circular suture tied	834
342. Appearance of gall bladder and drain just before closing the abdomen	835
343. The drain brought out through a supplementary stab and carried into the bottle	836
344. Tube anchored by safety pin to adhesive straps	836
345. Gall bladder shelled out of Glisson's capsule and the cystic duct being divided	837
346. A strip of folded rubber for drainage	838
347. Folded drain tied to cystic duct ligature with catgut	839
348. Glisson's capsule is sutured obliterating the defect, and omentum at- tached to it to prevent pyloric adhesions	840
349. Omentum interposed between suture line of Glisson's capsule and the pyloric region	841
350. Clamps left on stump of gall bladder carefully wrapped in rubber to prevent contact with the viscera	842
351. Catheter used as hepatic duct drain	843
352. Tip of catheter cut off, and suture inserted for anchoring it to the hepatic duct	843
353. Showing diversion of bile when the gall bladder is anastomosed with intestine	845
354. Purse string inserted in gall bladder and another in the intestine . .	846
355. Half of Murphy button in each viscus	846
356. Anastomosis complete after halves of button have been pressed together	846
357. A pus appendix treated by simple ligation with catgut	852
358. Proper position of the secondary incision for removal of the appendix, months after drainage of a primary pus appendix	854
359. The musculature of the abdominal wall	856
360. The position of the skin incision in the McBurney gridiron operation	856
361. Splitting the fascia of the external oblique longitudinally	857
362. Retraction of the external oblique for the longitudinal splitting of the internal oblique	857
363. A small opening being made in the peritoneum	858
364. The McBurney gridiron incision left wide open with soft rubber drain protruding	858
365. The skin approximated with adhesive after drainage has ceased . .	859
366. The position and relations of the pancreas	862
367. Enormous ovarian cystic tumor	875
368. Large pad on abdomen	876
369. Binder pinned on tightly over pad	876
370. An excellent form of paracentesis needle	877
371. Preliminary paracentesis of enormous ovarian cyst	878
372. Ligature on ovarian stump	879

FIG.	PAGE
373. End of stump caught in purse string suture which pierces broad ligament from behind	880
374. Stitch tied in front of broad ligament	880
375. Indwelling or retention catheter	904
376. Hagner bag	906
377. Hagner bag in place, with clamp for removal	907
378. T-bandage	916
379. T-bandage applied	917
380. Tampon tube	919
381. The umbrella tampon tube, and gauze packing	920
382. Umbrella tampon tube in position	921
383. Fistulous tracts involving the rectum and anus	922
384. Gauze packing introduced into the wound after excision of the rectum by the sacrocoecygeal route	934
385. Excision of rectum by the sacrocoecygeal route, showing clamps upon blood vessels	935
386. Position of patient when returned to bed with clamps securing the blood vessels	936
387. Showing patient in bed lying on his side	937
388. Excision of rectum by sacrocoecygeal route with sacral anus, showing large rubber tube inserted into the bowel	937
389. Excision of rectum by sacrocoecygeal route, with sacral anus in the upper angle of wound and gauze drainage in the lower angle	938
390. Phlegmasia cradle	947
391. Catheterization	949
392. Catheterization	950
393. Massage of breast	953
394. Massage of breast. Second motion	954
396. Massage of breast. Third motion	955
397. Stimulating massage of breast	955
398. Stimulating massage of breast	956
399. Electric heater closed	965
400. Electric heater open	965
401. Electric heater. Interior view	966
402. Proper exposure for uterine packings	972
403. Improperly packed uterus	973
404. Properly packed puerperal uterus and vagina	973
405. Packing instrument	974
406. Dressings ready for amputation stump	982
407. Towel bandage in place and stump elevated	982
408. A useful method of producing traction	987
409. A bone pin passed through the os calcis as a means of securing a high degree of traction	987
410. Showing protection of the soft parts in using bone pin traction	988
411. Sand bags attached to the bone pin and external rotation prevented as shown	989
412. Removal of dressings after varicose veins have been stripped out	1007
413. The appearance of the leg following multiple incision for varicose veins	1007

FIG.	PAGE
414. Starched erinoline of a mesh 24 to the inch	1014
415. Plaster of Paris cast cutter	1015
416. Leg rests, plaster of Paris pail, back rest, knife, and scissors . . .	1015
417. Cutting the loose threads of the plaster of Paris bandage	1016
418. Modified Taylor back brace	1017
419. Braces for club feet throwing weight on inner side of foot	1018
420. Stiff-legged brace	1018
421. Thomas extension knee splint with properly shaped ring	1019
422. Jones abduction and fixation frame for the hip	1020
423. Plaster of Paris cast applied for fracture of the tibia	1021
424. Outside iron, inside T-strap and raised inner side of sole to use after Pott's fracture	1023
425. Short spica cast	1024
426. Plaster of Paris body cast with trough for arm incorporated in the cast	1026
427. Cast worn by patient three months	1026
428. Plaster of Paris cast for fracture of the forearm	1027
429. Adhesive strips to hold elbow in flexion	1029
430. Operation and dressing for hallux valgus	1034
431. Abduction platform splint to be used after arthrodesis of shoulder .	1035
432. Showing ability to raise arm to head	1037
433. Bradford frame for patient with tuberculosis of spine showing bed pan in place	1037
434. Ankle brace with catch joint to prevent foot drop	1038

THE AFTER-TREATMENT OF SURGICAL PATIENTS

VOL. II.

CHAPTER LXIII

FACE AND CRANIUM

By Ellis Fischell, St. Louis, Mo.

Face

In a general way, wounds of the face are characterized by their tendency toward rapid healing. The plentiful supply of blood vessels, the free anastomosis of the blood vessels and lymphatics and the absence of definite fascial planes make serious infection a rare occurrence. To counterbalance these advantages, the face is the most conspicuous region of the body, and scars, which elsewhere would be considered negligible, on the face are a constant reminder of an unpleasant experience. Therefore it is the duty of the surgeon to plan, not only the operation, but also the after-treatment of all face wounds that the healing may take place as rapidly and with as little scar formation as possible.

Wounds of the Forehead.—If primary suture without drainage has been done, in many cases, no dressing other than an antiseptic powder is required; dressings of gauze and cotton are a source of irritation to the patient and should be dispensed with except when there is much wound secretion. In case drainage has been instituted, enough dressing should be applied to absorb the discharge. The drain should be removed as soon as dry (usually at the end of twenty-four hours). The stitches may be removed in forty-eight hours in those wounds the skin margins of which have no tendency to gape. Other wounds, with marked tendency to separation of edges, must remain sutured six days. After the stitches are out it is good practice to seal the wound (provided, of course, that there

is no evidence of infection) with collodion applied over a single thickness of gauze.

Wounds of the Cheek.—If skin and subcutaneous tissues alone have been incised, no dressing is required other than a mildly antiseptic powder. Stitches should be removed in forty-eight hours and the wound sealed with collodion over one layer of gauze. In wounds involving the deep structures, if a figure-of-eight suture has been employed to hold all layers, the stitches must be allowed to remain until there is no longer danger of separation of the muscles. The length of time which should elapse varies from six to ten days; always remembering that the longer the stitches remain the more pronounced will be the scar from the stitch holes. Dressings are applied to cheek wounds only in case of drainage; they are preferably of dry sterile gauze and absorbent cotton; dressings should be small and frequently changed in order to prevent skin irritation. Crusts should be removed daily, if necessary. In case the wound penetrates the mucous membrane, an antiseptic mouth wash should be used at two-hour intervals, gradually increasing the length of the intervals until the mucous membrane has entirely healed.

Wounds of the Nose.—As the nose is the most prominent part of the face, the after-treatment of wounds of this region is aimed at prevention of the scar from being any more conspicuous than is absolutely necessary. Here the best judgment is required to enable one to determine just when it is safe to remove stitches. In regard to dressings, the same rules apply here as to the cheek and forehead; they are to be used only if the quantity of wound secretion or discharge requires them. Splints, if used in the treatment of fractures of the nose, should be changed as frequently as their condition requires, and should not be dispensed with until there is no longer any tendency toward redisplacement of the fragments.

Wounds of the Lips.—No dressing is required unless drainage has been established. Superficial stitches should be removed on the sixth day, deep stitches on the tenth to twelfth day. Crusts almost invariably form on these wounds and should be removed daily. If the mucous membrane has been injured, an antiseptic mouth wash is indicated. These wounds seldom remain free of some infection, which tends to accentuate the scar.

Wounds of the Chin.—Wounds of the chin, especially in men, are the least noticeable of the wounds of the face. If the wound has little tendency to gape, the stitches may be removed in four to six days. The same rules in regard to dressings and the removal of stitches are applied here that apply to the cheek.

Complications.—Hemorrhage may be primary, occurring immediately after the patient is put to bed or, as is more usual, some days after the operation due to wound infection and slough. The treatment of the former condition should constitute part of the operative judgment of the surgeon. If the wound was reasonably dry when the dressing was applied whatever bleeding occurs will in all probability stop as soon as the blood pressure drops to the point at which it was at the conclusion of the operation and will not recur. In rare cases this bleeding, shortly after the operation is concluded, will be severe enough to require blood transfusion. Should this be the case, it is far safer to reopen the wound under a general anesthetic if necessary and tie the offending vessel. Secondary hemorrhage after operations about the jaws is far more frequent and significant. It may make its appearance at any time from three days to four weeks. It is due to the infection of a clot in a large artery which so softens the clot that it is blown out. It is the rule that the first evidence of secondary hemorrhage is brisk bleeding of bright red blood which stops spontaneously before the patient becomes alarmed or considers the condition serious.

This first appearance of bleeding some days following operation is of the utmost significance to the surgeon; there will almost invariably be a recurrence unless measures are taken to prevent it, and it will ultimately prove fatal. The vessels most commonly affected are the lingual, the facial and the internal maxillary arteries. Unless the offending vessel can be isolated far from the infected field, the external carotid must be tied close to its origin. Unfortunately the anastomosis between the branches of this artery and the corresponding artery of the opposite side are so free that it is not at all uncommon to find that this procedure will not suffice. In case bleeding recurs, the common carotid must be ligated. Tying the common carotid is followed by hemiplegia and coma in some cases and is always to be undertaken as a life saving measure only. After amputation of the tongue if the bleeding arises within the mouth, ligation of the lingual artery in the digastric triangle will usually stop the hemorrhage.

Wound infection in operations on the jaws, where the mouth cavity is opened, is the rule. In burning operations within the mouth or of the cheek, for carcinoma, the slough separates usually between twenty-one and twenty-eight days. During this time the patient can be kept much more comfortable if the sloughing tissue be trimmed off as fast as it loosens. If clean incised wounds become infected, enough sutures must be removed at once to pro-

vide free drainage. Occasionally one sees a brawny induration spreading from the suture line without the formation of pus. Suppuration can frequently be prevented in these cases by the application of an ice bag, separated from the wound by two layers of sterile gauze and a sheet of sterile gutta-percha tissue.

Special Operations

Upper Jaw.—These will involve either the palatal process, the body or the alveolar process, singly or in combination; the principles of treatment are identical. At the conclusion of the operation all cavities in the bone, which open into the mouth, should be packed with iodoform gauze wrung out in balsam of peru. This pack may be left in place without change for four days. The cavities should be packed lightly thereafter until there are no longer pockets for the collection of food particles. A mouth wash is to be used at frequent intervals. Excessive granulations are best removed with the knife or scissors. In case the operation has been done for the removal of a carcinomatous growth, close watch must be kept for possible recurrence and the granulations are best removed with the actual cautery.

Lower Jaw.—The most common operations on the mandible are excision of tumors, extraction of impacted teeth and various operations for fracture. After operation all cavities in the bone or gums should be packed, as described under the previous heading. Fixation wires or plates used in the treatment of fracture should be removed as soon as union has taken place which can be expected in from three to six weeks. After fixation appliances have been removed, soft diet should be insisted upon until firm bony union has taken place. If fixation has been maintained by wiring the lower to the upper teeth, methods of feeding are of primary importance. All fluids can be sucked in either between the teeth or around the last molars; even soft foods may be fed by forcing them through a short rubber tube, one-half inch in diameter, inserted behind the last molar teeth. As all fractures of the mandible are compounded, an antiseptic mouth wash frequently used is important.

Oral Cavity.—The usual operations on the soft tissues within the mouth will be for cysts, for stone in the salivary ducts, for tumors of the buccal mucous membrane or of the floor of the mouth, and operations on the tongue. The chief aims of the postoperative treatment are to keep the mouth as clean as possible by means of a mouth wash and to prevent serious infection. Wounds which

do not penetrate deeply into the tissues give but little trouble. The stitches may be removed in six days. Wounds following the excision of tumors which are too broad to allow the margins to be coapted without tension should be packed with iodoform gauze wrung out in balsam of Peru. Deep wounds which have been sutured, if there is any sign of infection, should have enough sutures immediately removed to allow free egress of pus.

Operations upon the tongue require special consideration. Small partial excisions heal readily and the stitches may be removed in from six to eight days; more extensive resections, with marked deformity of this organ, require a longer period of time for union and the stitches should be left in ten days. Amputation of the tongue at its root requires great postoperative care. It takes at least three days for the patient to learn to swallow; during this period fluids must be given subcutaneously, per rectum, or through the stomach tube. Nourishment is given in liquid form by stomach tube, or better through a small tube passed through the nose; a careful watch must be kept for the first signs of developing pneumonia, and suitable measures promptly instituted for its prevention (see General Principles). In case the cautery has been used in the amputation there is danger of asphyxiation from edema of the glottis which must be met by immediate tracheotomy.

Temporomandibular Joint.—Operations on the temporomandibular joint will almost invariably be undertaken for the relief of ankylosis. The immediate dressing of the wound should be voluminous, out of all proportion to the size of the incision. The most important consideration in the after-treatment is to prevent the accumulation of fluid in the wound because such an accumulation endangers the life of the flaps which have been interposed to form the new joint. If drainage has been used the drain should be removed at the end of forty-eight hours and can occasionally be removed earlier. The stitches may safely be removed in forty-eight hours, provided the suture line is supported by strips of gauze crossing the suture line and tacked down by collodion as the sutures are withdrawn. In case no drain has been inserted, the wound must be closely watched for a collection of fluid. If there is such a collection it should be aspirated, daily, through a 20-gauge needle attached to a 5 c.c. Luer syringe. All dressings may be removed at the end of seven days. In order to maintain the separation obtained at operation, the patient should be given a rubber stopper and be instructed to insert it between the teeth of the operated side several times daily until there is no longer a tendency for the "bite" to be diminished.

Some patients stand the wiring of the teeth apart over a block better than others. It is advisable to keep the teeth so separated one week following operation, but quite satisfactory results have been obtained with no fixation at all or, even in cases with a marked tendency to recurrence, with fixation of but forty-eight hours duration.

Harelips.—The harelip operation will ordinarily be undertaken in early infancy. If the infant shows immediate effects from loss of blood or shock incident to the operation, two ounces of warm normal saline solution are given per rectum. After repair of the lip, some

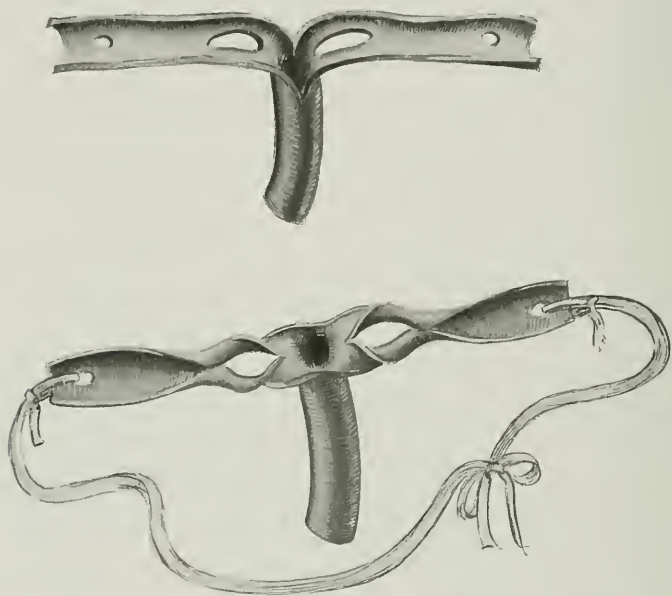


Fig. 222.—Breathing tube to be used following harelip operations.

infants will show obstructed respiration due to inability to breathe through the nostrils. The lower lip is sucked in at each inspiration and there will be slight cyanosis. Such a condition is easiest combated by the insertion of a soft rubber breathing tube (Fig. 222). The most common complication is infection of the wound. This is best taken care of by painting the wound, nostrils and lip with a 10 per cent colloidal silver solution at the close of the operation and by keeping the wound free of crusts. Crusts are removed by cotton pledgets squeezed out in a 4 per cent borie acid solution. The stitches in the wound are removed on the sixth day after operation; the stitch supporting the nostril is removed on

the tenth day and the deep supporting and hemostatic stitch through the lip on the twelfth day. Postoperative hemorrhage is a rare occurrence, but may be so severe as to require packing. The bleeding will occur from the artery to the ala nasi, and the pack, which should consist of two layers of gauze one-half inch wide wrung out with 10 per cent colloidal silver, should be applied under the lip in this region. In one case we resorted to the injection of 20 c.c. of the mother's blood underneath the pectoral muscles of the infant before the bleeding ceased. As soon as the infant is sufficiently out from the influence of the anesthetic, two drams of castor oil and ten drops of paregoric are given. Nourishment is resumed as soon after the operation as tolerated. Mother's milk is best; it should be obtained with a breast pump and fed to the infant with a sterile medicine dropper. If the mother's milk is not obtainable condensed milk is the best temporary substitute. The patient may be put to the breast after forty-eight hours or may be encouraged to take the nipple.

Cleft Palate.—There is usually more shock and hemorrhage accompanying operations for cleft palate than for harelip. Immediate hemorrhage is controlled by a pack of gauze wrung out in colloidal silver; this pack should be removed in twenty-four hours. Blood is supplied and hemorrhage controlled by the injection of 20 c.c. of the mother's blood beneath each pectoral muscle. Stitches are allowed to slough out or are removed some weeks following the operation. The wound is not inspected for one week following operation. The immediate postoperative care is the same as that for harelip. Three drops of a 15 per cent argyrol solution are dropped in each nostril after each feeding unless it causes vomiting.

Cranium

Wounds of the cranium deal with the bony vault, its coverings or its contents. The coverings of the bone are the pericranium, a layer of connective tissue between the pericranium and the aponeurosis of the occipitofrontalis muscle, the occipitofrontalis muscle with its aponeurosis, the subcutaneous fat, and the skin. These five layers constitute the scalp. By reason of its intimate connection with the aponeurosis of the occipitofrontalis muscles, wounds of the skin only have little tendency to cause serious trouble. The rich blood supply causes them to heal more rapidly than those of any other tissue in the body, while the fibrous tissue prevents spread of infection. Wounds which involve the aponeurosis, however, must

be treated with due consideration. The areolar tissue beneath the aponeurosis prevents no hindrance to the spread of infection over the entire vault from above the eyebrow to the superior curved line of the occipital bone. Wounds involving the perieranium, if infected, may cause extension of the infection to the meninges through the diploë.

Wounds of the bony vault in general are liable to the same complications as injuries to bone in other locations. In themselves they cause little trouble; it is only because of the importance of the structures within the cranium that injuries to the vault are important.

Within the cranium are the coverings of the brain, large blood vessels, and the brain itself. The dura is a strong, dense, inelastic membrane capable of restraining the brain under normal conditions of pressure without the help of bony support. The largest blood vessels and venous sinuses are located within its tissues. The pia invests the cortex of the brain most closely. It is an exceedingly thin, transparent membrane, rich in small blood vessels. Any laceration of the pia usually means rupture of brain cortex with loss of brain tissue. The brain itself has no power of regeneration or repair; it does not bleed when lacerated or incised; it can be expelled and lost through an open wound in unbelievable quantities without any demonstrable effect. On the other hand, wounds or destruction of tissue in areas of definite highly specialized function are followed by gravest consequences.

In the consideration of the postoperative treatment of wounds of the cranium, it is perhaps simplest to describe what is necessary to be done first, in surgically clean wounds and, secondly, in the surgically unclean or infected wounds. Complications can be treated in a separate subdivision.

Surgically Clean Wounds.—Protecting spreads and towels should not be removed or displaced until the line of incision and surrounding skin have been effectually covered. Silver foil has a peculiar field of usefulness in this class of operations, and whenever available should be used without stint. After the application of the foil, all protective cloths may be removed from about the head. Dried blood and clots should be washed out of the hair or removed from the surrounding skin by the plentiful use of sterile water and sterile towels or sponges, the head meanwhile being supported by an assistant whose hands must be surgically clean and whose duty it is to direct the extent and thoroughness of the cleansing. It is far better to leave a small amount of blood on the

shaven skin than to risk contamination of the wound in the zeal to remove all blood. Touching the suture line with tincture of iodine is to be condemned. The doubtful advantage of the protective action of the iodine is more than counterbalanced by the danger of skin irritation from its use.

Sebaceous Cysts.—Sebaceous cyst operations are the simplest surgical procedures performed on the cranium. No drainage is necessary. A collodion dressing may be employed, which can be left in place until the stitches are removed on the fourth day. Further collodion dressing should be used for four more days when all dressings may ordinarily be dispensed with.

Exploration of Hematoma.—Exploration of hematoma by linear or curved incision through aseptic field, with immediate closure. A large primary dressing containing much dry fluff gauze completely covered by sterile absorbent cotton is indicated in all wounds of the scalp which penetrate the aponeurosis of the occipitofrontalis muscle. This initial dressing is left in place for forty-eight hours, after which time has elapsed the stitches may almost invariably be removed and a simple collodion dressing applied. In case buried supporting stitches have not been used, or if there is much tendency for the wound margins to pull apart, it may be necessary to leave the stitches for four days. If the exploratory wound is large, or is located upon that part of the scalp upon which the patient usually rests, a protective dressing of gauze should be applied over the collodion dressing after the latter has thoroughly dried.

Decompression Operations.—Decompression operations will ordinarily be performed beneath the temporal muscle and the same rules as to primary dressings and the removal of stitches apply here as to the wounds for exploration of hematoma. But it should always be borne in mind that in decompression operations the dura has been opened and even the smallest infection from a stitch abscess might prove fatal to the patient if the sutures and dressings are not properly cared for.

Plastic Flaps from the Scalp.—The wound should be inspected at the end of twenty-four hours if tension or twisted pedicle makes questionable the viability of the flap. Stitches which are not assisting in the retention of the flap in position should be removed in forty-eight hours; others may be left three to five days; occasionally it is good practice to cut a stitch which is strangling tissue, leaving its removal until the next dressing. If the transplanted flap appears blue and threatening at the first inspection, multiple

punctures with a sharp pointed scalpel may release enough engorged blood to save the flap.

Osteoplastic Flaps.—Osteoplastic flap operations will almost invariably be performed for purposes of wide exploration of the brain for tumor. The chief concern in the postoperative care is to prevent the accumulation of fluid between dura and the under surface of the bone flap. This is best accomplished by the use of a voluminous dressing and a snug fitting bandage. The larger the dressing, the more elasticity it has, the tighter can the bandage be applied. In this type of operation, supporting buried sutures will usually be used, therefore the skin sutures may be all removed, or at least cut, at the end of forty-eight hours. In case fluid collects beneath the bone in such quantities that there is no contact between the cut margins this fluid should be aspirated, using the strictest aseptic precautions and the greatest care not to puncture the dura. These aspirations must be repeated as often as necessary to keep the bones in apposition.

Operations for Repair of Defects.—Operations of this description are undertaken to replace either lost dura or lost bone, or both. The general principle that all grafts should have as many points of close contact with normal tissue as possible applies here as elsewhere; accordingly all possible care must be taken in the after-treatment of these cases to see that just enough tension is exerted by the dressings to keep the parts internal and external to the graft in close contact with the graft, and to remove harmful collections of fluid between the graft and normal tissue as soon as detected.

Surgically Unclean Wounds.—**Operations Through an Infected Field.**—The postoperative treatment of cases falling within the scope of this heading will depend largely upon the type and the procedure of the operation itself. If the operator has followed the practice found efficacious in many cases of infected or contaminated war wounds and has made an attempt to remove all contaminated tissue at the time of operation, followed by complete suture of the wound, the postoperative treatment should be directed to retain all the advantages of such an operative procedure with the minimum of risk to the patient. This calls for the most scrupulous care in the inspection of the wound and in the observation of the patient. At the first sign of impending infection of the wound, enough sutures must be removed to permit free egress of wound secretions. In some cases, hot boric acid packs will head off an impending skin infection. It should always be remembered that cerebral hernia is less to be feared than meningitis. Therefore it is better by far to

open the wound too early and too widely than to delay opening too long.

Operations for Brain Abscess.—Here the postoperative problems are to take care of the drained off pus adequately and to be sure that drainage is maintained for a sufficient length of time. Dressings (dry or moist) should be changed as frequently as the amount of drainage demands. As soon as a dressing ceases to absorb the discharge, it is no longer a protection to the wound. Drains require special attention. The pulsations of the brain have a marked tendency to force even rigid tubes from the wound. It is the duty of the operator to see that all drains are firmly anchored to the wound margin. In the postoperative care these drains must be kept in place until there is no more discharge. In case the drain is forced out before the wound is dry, the drainage tract should be reopened by the insertion of thin-bladed hemostats with the utmost gentleness, after which the drain may be reinserted.

Operations for Meningitis.—Operations for meningitis will be rarely undertaken and their postoperative care will depend upon what operative procedure has been carried out. They offer no unusual difficulties; the same rules in regard to dressings and the handling of drains being applied here as to the treatment of brain abscess.

Operations for the Removal of Sequestra.—As the bony vault lies superficially, unless the sequestrum is situated within the dura, the wound caused by the removal will heal rapidly with the simplest possible after-care. If the sequestrum has penetrated the dura, its removal is attended with all the possible ill effects and postoperative dangers which accompany the removal of any foreign body from the brain substance. The closest watch must be kept upon the patient for the manifestations of intracranial complications and the wound must be carefully inspected for signs of infection.

Complications.—In no field of surgery do postoperative complications play so important a part in the ultimate outcome of the case as they do in surgery of the cranium. In their earliest possible recognition and proper treatment lies the best, frequently the only, chance of the patient for recovery. It is for this reason that all cases in which serious complications are possible should have especially close postoperative observation by a competent interne or a nurse experienced in handling head cases and able to take blood pressure readings. Systolic and diastolic pressures and pulse rate should be recorded each five to ten minutes until the surgeon is satisfied the immediate danger period is past.

Hemorrhage.—Postoperative bleeding from the scalp wound is a rare complication and little to be feared, provided it is promptly detected and controlled. If blood has collected beneath the skin or aponeurosis of the occipitofrontalis, it should be evacuated through the suture line of the scalp; if the bleeding vessel can not be readily clamped and ligated, a properly placed deep suture of silkworm gut will always control the hemorrhage. In an operative wound packing should never be necessary for the control of hemorrhage from a scalp vessel. Intracranial hemorrhage, on the other hand, is one of the most serious complications. If brisk and free, the wound must be reopened, the offending vessel must be identified and carefully ligated. In case the bleeding is from the middle meningeal, close to its emergence into the skull, it is simpler and quicker to plug the foramen spinosum with muscel or moist cotton or even a thin peg of lead than to attempt ligature or the application of Cushing's wire clamp. Hemorrhage from the larger venous sinuses must be controlled by gauze packs. The intracranial venous pressure is so low that the smallest pack which will cover the tear in the sinus will ordinarily suffice. However, in the case of transverse cuts into the longitudinal or lateral sinuses it is occasionally necessary to place the pack directly in the lumen. These packs must be left in place four days; other gauze packing may be removed in twenty-four hours. Collections of blood which arise from the diploë or cut bone edges should be drained off by two or three thicknesses of rubber dam drain; this drain should not remain in the wound longer than twenty-four hours.

Shock.—The rather severe hemorrhage and long anesthesia incident to many intracranial procedures make postoperative shock a rather common occurrence. Usually no special measures are necessary for its control. However, no severe intracranial exploration should be undertaken without the realization that most energetic treatment to combat shock might be necessary. Therefore it is well to have a matched donor and proper apparatus for blood transfusion always available. Gum acacia and glucose solution has been found to be of equal value to blood transfusion and if properly prepared and allowed to run into the vein of the patient slowly, it may be given instead of blood. It must not be forgotten that morphine, external heat, physical and mental quiet are to be employed here as well as in shock following operations on other regions of the body.

Respiratory Failure.—This much dreaded complication will almost invariably be caused by disturbance in intracranial pressure

with its consequent effect upon the respiratory center in the medulla. If increased quantity of cerebrospinal fluid is thought to be the cause, ventricular puncture should be performed. If there is reason to suspect an intracranial collection of blood, the wound should be exposed sufficiently to drain it off or to disprove its presence. Sodium cyanide in the strength of 100 mg. to 100 c.c. of salt solution given intravenously has been demonstrated by Lowenhardt and others to be an unfailing respiratory stimulant. Even in cases where marked edema of the lungs is present, this solution may be confidently relied upon to improve the condition at least temporarily. Its intravenous use should be instituted while the underlying cause of the condition is being sought and its use should be persisted in so long as danger from respiratory failure is present.

Hernia Cerebri.—Hernia cerebri results either from imperfect closure of the wound or increased intracranial pressure. The indication for treatment in the former case is the properly selected operation to remedy the defect. Fascial transplants are the best for bridging gaps in the dura; broad cartilage or bone grafts from the tibia or ribs can ordinarily be used to replace bone. In hernia due to increased intracranial pressure, closure of the defect without removal of the cause of the increased pressure will invariably prove disastrous to the patient. The indication here is first to remove or remedy the cause of the increased pressure by the appropriate operative procedure; only after this is accomplished should the closure of the defect be undertaken.

CHAPTER LXIV

OPERATIONS UPON THE NECK

By Willard Bartlett, St. Louis, Mo.

Especial significance attaches to the treatment which follows extensive wounds upon the neck. This becomes pertinent when one takes into consideration the comparatively unprotected important structures which run through it. The interruption of blood supply to the brain or of oxygen to the lungs must, as a matter of course, become speedily fatal, to say nothing of the less speedily dangerous interference with the function of the esophagus. The thoroughly protected spinal cord is not at all likely to suffer in this connection, but the vagi, phrenics, sympathetics and large nerves which supply the upper extremities must be taken into consideration in every resumé of the vital links which connect the head with the trunk.

Furuncles.—Furuncles appear so frequently on the back of the neck and are a subject of so much distress that their separate consideration will be taken up in connection with the special treatment of this part of the body. The fact that they are treated in so many different ways after incision makes it self-evident that no one universal successful form of treatment has been discovered.

The various wet dressings as well as the dry ones which later become "pus poultices" have often failed to keep up continuous drainage and at some time permitted the reinfection of surrounding hair follicles and skin. Unpleasant personal experience with this malady led me to undertake a line of treatment which was so highly satisfactory that I have used it with unvarying success ever since that time. It presupposes the lesion to have been widely opened at the proper time, then if a sufficient period has elapsed before the incision has been made, the necrotic center of the lesion can be lifted out at once; but if it is not loose, gentle suction should be employed every hour or so, the wound being merely covered by a vaccination shield and exposed to the rays of an incandescent bulb, placed so close to it as to produce an agreeable degree of warmth.

A fifteen watt lamp gives a delightful sense of comfort as my own recent experience has demonstrated, while the ordinary green metal household shade protects surrounding parts from heat and

light. In a short time the necrotic center can be sucked out *in toto*, after which the defect rapidly granulates up and no further treatment is needed than the occasional cleansing with alcohol, to prevent the reinfection of the surrounding skin openings; protection of the wound with a vaccination shield, between treatments is recommended.

Suction with the Bier cups reduces the edema in adjacent muscles with consequent early disappearance of the stiff neck so characteristic of this condition.

Suppose the lesion is on the back of the neck and any form of circular bandage be worn, painful pressure and distressing massage of the affected area are experienced every time the head is turned. To avoid this form of torture, the patient endeavors by using all of the neck muscles, to hold the head at rest, and very soon added excessive local fatigue, makes his lot still more unhappy. It may be further said that any form of dressing makes a pus poultice, and accounts in a great measure for reinfections and neighboring secondary furuncles, while on the other hand the growth of bacteria is hindered by the drying up of excretions from a wound exposed to the air.

This treatment may be carried out by an intelligent member of a family or office force, which brings it well within the range of possibility for many men without upsetting the ordinary routine of life. If carried out faithfully, with regard for every detail, it robs this distressing malady of its most serious features. The sort of "stock" affected by horsemen and golfers, can readily be worn over the vaccination shield, and the patient be rendered somewhat uncomfortable, though much more presentable than is the case when an otherwise well-groomed man with stiff neck goes about minus collar and tie, with a surgical bandage where the other should be.

Carbuncles.—Every one of the foregoing suggestions in the treatment of furuncles can be applied directly to the local treatment of carbuncles. We shall start with the assumption that the carbuncle has been subjected to what we believe to be the only proper, thorough, conservative operative treatment, namely: total destruction with the actual canterbury, which useful procedure was first demonstrated some fifteen years ago by that most versatile surgeon, Dr. C. H. Mayo.

This can be done perfectly well under infiltration anesthesia provided the operator has the patience to completely surround the lesion with one-half per cent novocain and then wait twenty minutes. Surely this suggestion will appeal to those who fully ap-

preciate the desolate general condition in which this class of patients frequently find themselves. The after-treatment must emphasize general as well as local measures, since a carbuncle probably never appears in a patient enjoying perfect health, and above all things, a urinalysis and blood sugar determination must be made, in view of the fact that a fairly large percentage of diabetic individuals develop carbuncles at some time in the history of their disease, and no local measures will be completely efficacious in the absence of consistent general treatment for the underlying malady.

The same is, of course, true of the depleted nondiabetic individual. He must be properly rested, fed, kept out of doors if possible, and made to eliminate if the local measures referred to under furuncles and those about to be described are to show the maximum results.

The underlying principle in the treatment of a wound which results from destruction of a carbuncle with the actual cautery, is keeping it dry. The operator will have destroyed most of the pus-producing germs present, then since moisture is indispensable to the propagation of those that are left behind, the reason for maintaining a dry wound becomes at once apparent. Since every form of dressing in time holds back wound excretions, I have dispensed with dressings of all kinds and leave such defects wide open, exposed to air and light.

It is a perfectly easy matter to keep a wound wide open where there is no thought of it coming in contact with the bed linen or the patient's clothing. When, however, this feature must be considered, it is well to cover it with a perforated vaccination shield or still better, with some one of the wire gauze sieves or strainers on sale in every hardware shop and commonly employed in culinary pursuits.

Crile and others have called attention to the fact that the intense sunlight in the desert cures chronic inflammatory infections, and that the rays of an incandescent bulb are chemically very similar to sunlight, hence one who reasons by analogy has an ever ready adjunct to the open treatment in the application of electric light two or three inches from the wound for as many hours out of the twenty-four as the patient is not disturbed by its presence. In addition to any active therapeutic effect there is every positive suggestion for the patient that intensive treatment is being carried out.

A few days after cauterization, the separation of charred tissue masses from healthy granulating surfaces will begin. Their elimination can be greatly aided by delicate and judicious use of the dressing forceps. No attempt should be made to lift out a mass

which is still firmly adherent. One can be reasonably sure that he is on the safe side as long as he does not cause hemorrhage. Of course, forcible removal of these sloughs is sure to break through the surrounding barrier of granulation tissue with the possibility of localized reinfection.

After all necrotic masses have been removed the large defect will granulate up in a surprisingly short time, provided the patient's general condition is on the mend. The closure of the external wound is, of course, favored at this period by the application of adhesive straps which tend lightly to approximate skin edges. I very frequently complete the after-treatment with a skin graft, which saves the patient from an annoying open granulating wound during the long period required for epidermization of a considerable area.

The *general* care of these patients is shown to be of utmost importance by a recent example in my practice. A gentleman who refused to leave his work experienced one carbuncle after another for eight months in spite of all the *local* therapeutic measures detailed above. The situation was never controlled until he entered the hospital where his resistance was improved by rest, proper feeding, and vaccines, while a nurse *cleansed his fingers with alcohol every half hour day and night to prevent subconscious reinfections* by scratching distant skin.

Tracheotomy.—The introduction of serum treatment and of intubation relegated the once common operation of tracheotomy to the realm of the rarer surgical procedures, nevertheless, there are occasions when it will be performed and the very nature of it presupposes an *urgency* second only to the measures intended for the control of hemorrhage.

Where the operation is done in the course of any inflammatory affection of the trachea the employment of a *double* tube is a matter of course, since there is a great tendency for exudate to block the lumen. The obstruction can be most easily removed if the inside tube is slipped out and as has been the custom from earliest times, a feather run through it.

A tracheotomy patient must be constantly watched for the first few days for any signs of *obstructed* breathing as his safety will depend upon the tube being kept clear. The tube (Fig. 223) is much more likely to remain unobstructed if the excretion is kept in the fluid state, a thing which is favored by the patient breathing the damp air which results from a basin of water kept boiling constantly in the room.

A few layers of gauze should protect the outer orifice of the tube since all sorts of *foreign bodies*, some of them alive, have been aspirated through a tube in times past. This gauze should be kept wet with a mixture consisting of equal parts of water and of glycerin.

When it becomes necessary for any purpose to change the *outer* as well as the inner tube, this must be done without the loss of a second since one who has not had experience will be astonished at the rapidity with which the opening shrinks down to the size which will make the reintroduction of the cannula impossible.

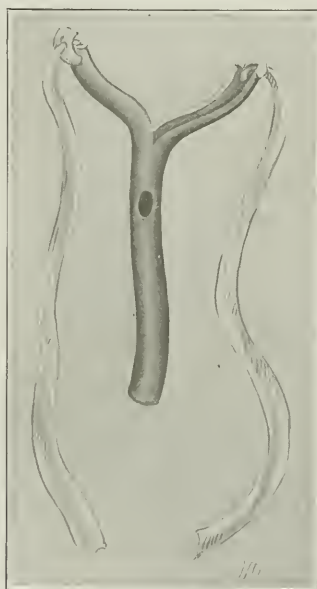


Fig. 223.—Emergency tracheal tube, made of rubber tubing.

Opinions vary within certain bounds as to the length of time a tracheotomy tube should *remain in place*; a matter which must conform to the requirements of the case in hand. So far as diphtheria is concerned, most of the older authorities have agreed that this once highly useful implement has subserved its purpose at the expiration of six to ten days.

It stands to reason that the greatest care must be taken to prevent the outer and inner tube becoming *displaced* at the same time. Sudden deaths are on record as a result of this accident, and where it has occurred leaving a tortuous and partially obstructed channel

but one which admitted enough oxygen for the support of life, air has in numerous instances found its way into the tissue planes with a resulting emphysema of varying degrees.

Decubitus of the tracheal wall has followed the pressure of an ill-fitting tube, being most often seen at the point where the inner end comes in contact with the anterior wall of the viscus instead of the posterior as might have been expected. Of course, decubitus can result from contact of any portion of the tube with the tracheal wall, but it has been most marked at the site mentioned.

Spontaneous secondary *hemorrhage* of every degree has resulted from pressure of the tracheotomy tube in isolated instances. This is, of course, not difficult to understand when we take into consideration the pathologic condition for which this operation has usually been performed. Decubitus has in many instances played a role in the causation of unexpected bleeding.

Granulomata of size sufficient to seriously obstruct the trachea have sprung from the edges of the new opening. Herein is seen an excellent argument for not allowing a tube to remain in position any longer than is absolutely essential to the safety of the patient.

In some instances a thin, *weak segment* of the tracheal wall has resulted from the performance of tracheotomy. This becomes a menace at times, inasmuch as it may be drawn into the lumen on forced inspiration and tend in this way to obstruct the passage.

Stenosis of varying degrees has now and then constituted a very serious after-effect of this operation. We have observed one patient in whom this became so marked in the course of time as to seemingly almost completely obstruct. A reoperation was necessary, and after the failure of repeated attempts to reconstruct the passage by plastic means the patient was reduced to the extremity of wearing a permanent tube.

Scars in and around the trachea lead, in highly sensitive individuals, to a most objectionable train of nervous symptoms. I have in mind now two girls who are nervous wrecks from the constant annoyance to which they are subjected. For years they have experienced subjective sensations which lead them to fear that impending suffocation is not far off. No amount of reasoning based upon the absence of serious symptoms pointing to respiration and circulation suffices to offset the effect upon the nervous system of the scars in this to them, highly important situation.

The *cosmetic* results of many an old time tracheotomy were so bad that more than one beautiful young woman never dons evening dress. Just recently I was consulted by a woman who desired a

plastic operation for the removal of an unsightly nonpigmented depression of considerable size where the tube had rested many years before.

There has long been an adage in the medical profession that the tracheotomy patient is sure to be *short lived*. I have been unable to trace this saying to a reliable source and do not, myself, vouch for it. It is mentioned merely for the interest which most attach to it for the older generation of surgeons.

Ligation of Thyroid Vessels.—*Goiter*.—Kocher brought most of the otherwise inoperable exophthalmic goiters into the realm of surgical therapeutics when he proposed preliminary ligation.

Thyroidectomy is now universally done where it is considered safe, hence ligation is reserved for the bad risks. Thus is explained the apparent absurdity that a higher *mortality* accompanies ligation than primary thyroidectomy.

There may be after ligation a sudden acute exacerbation of all the well-known symptoms of the disease and in consequence the important treatment is *general* in character, while practically no attention has to be directed towards the three or four centimeter incisions in the neck. Absolute bed rest in a quiet dark room is essential, we have found also that a tactful nurse with a sunny disposition can do more by her presence and encouragement to soothe one of these wildly restless patients than is possible in any other way. Suggestion, even attempt at something like hypnotism, does more to steady the sufferer than drugs of any kind.

I have on occasion used a large quantity of *morphine* as often as necessary to secure a pronounced physiologic effect, although it must be clearly understood that too small a dose of this drug is distinctly worse than none at all, since it merely adds to the excitement. Bromides are of distinct value in certain instances, the only difficulty in connection with their use being the introduction of them in sufficient quantity to do any good. I have followed the old time custom of keeping an ice bag on the neck two out of every three hours, although one must admit that there is a question as to just how deeply the chilling effect penetrates the tissues.

Since thyroidectomy is never done in a patient with an outspoken right-sided cardiac dilatation the *circulatory* system presents one of the chief problems in every ligation case. As this is written I have in hospital a middle aged lady whose upper poles were ligated one week apart with a marked dilatation of the right heart, much free fluid in all the serous cavities and anasarea up to the shoulder blades. She has an ice bag on the heart two out of

every three hours and is on a digitalis regimen. The ligations have apparently not harmed her and she is holding her own, to say the least.

It is always well to maintain an intake and output chart when treating these individuals, since the introduction of sufficient *fluid* for their physiologic needs, either by mouth, rectum, or subcutaneous fat is a matter of pronounced difficulty in the presence of the characteristic vasomotor symptoms of a decided type; namely vomiting, purging, and sweating.

In a few instances I have ligated *both* upper poles at the same sitting, and in one patient so treated, the result was little short of magical. Within two days after the operation the young woman's exophthalmos and tremor had disappeared, while she spoke of the most marvelous improvement in subjective symptoms.

Numerous theories have been devised to account for the *improvement* which follows ligation. Probably no one of them is entirely satisfactory and it may be that all combine to bring about a happy result. I am not prepared to grant that it is a matter of simply cutting off enough blood supply to greatly decrease the quantity of toxic secretion, hence, have not limited my ligation to the superior thyroid arteries alone, but have attempted to take in as many veins and lymphatics as possible, at the same time hoping thereby to interrupt in great measure the absorption of altered thyroid secretion. These patients continue to improve for three, four or even five months, but ligation offers nothing more than the hope of temporary benefit, hence, a thyroidectomy must not be deferred more than six months, as a return of symptoms is likely soon after the expiration of that period.

Thyroidectomy.—The treatment set forth in detail above for ligation is equally applicable to the toxic patient whose gland has been removed, since both operations tend to cause an *exacerbation* of all the characteristic symptoms of the disease.

In considering the after-treatment of thyroidectomy we shall then concern ourselves with the local and mechanical complications which a simple goiter patient as well as one of the toxic variety may encounter.

Reactionary *hemorrhage* is by no means unknown. This has been more frequently traced to the superior thyroid artery than to any of the other vessels concerned. This, no doubt, is accounted for by the fact that a bit of muscle is sometimes impressed in the ligature and in a patient's early struggles the vessel is freed and retracts a considerable distance upward. In one instance I had a

patient returned from bed to the operating room in a condition bordering on suffocation one hour after the operation. Newly formed spaces were distended with clotted and fluid blood which exerted so much pressure upon the trachea as to practically obliterate its lumen. Without loss of time the wound was torn open, the patient immediately secured a full breath and the intense cyanosis disappeared. I was then able without difficulty to re-ligate the bleeding artery. The patient made an uninterrupted recovery, but the experience was one never to be forgotten.

In a second instance a very much smaller vessel must have been at fault, since there were no manifestations of suffocation, but



Fig. 224.—The patient in bed on the face, immediately after goiter operation.

the patient's neck continued to increase in size until twenty-four hours after operation when its circumference was about equal to that of the head. In this instance there was spontaneous cessation of bleeding and the patient slowly recovered.

These patients complain more of *sore throat* than of any other symptom which follows thyroidectomy. No doubt, it is due in part, to direct handling of the trachea. There is usually an immediate traumatic laryngitis and tracheitis with a marked hypersecretion after ether from the lining membranes of these passages. As a rule these fluids are allowed to run down and fill up the bronchial tree, with a result that it is several days before the patient can by coughing, completely expel them and regain her comfort.

It has been our custom for the last year or two to place these individuals in bed immediately after the operation, upon the face with the body slightly elevated and the head hanging down (Fig. 224). A consideration of anatomic structures reminds the reader that the bifurcation of the trachea thus becomes the high end of the tube which *drains down hill* as far as the lips and in consequence during the first few hours, the patient is completely freed of all early hypersecretion. Steam (Figs. 225 and 226) is kept forming in the room during this early period with the result that the patients



Fig. 225.—The goiter patient inhaling steam soon after operation.

experience a vastly more satisfactory, quiet and comfortable convalescence than was thought possible before this line of treatment was instituted.

There are surgeons who get along without *draining* their goiter wounds, but there are a comparatively few instances in which it seems better to employ a split, soft rubber tube rather than prolong the operation until absolute hemostasis is secured. It is my custom when drainage is employed to so place the tube that it crosses the defect in which the gland lay and emerges at both angles of the skin incision, thus establishing a "through-and-through" drainage (Figs. 227-230). I find myself leaving this tube in place longer than formerly. I now never remove it before the discharge has ceased.

and have, in large goiters, found it to drain copiously as long as ten days.

The critic might assume on first thought that a tube so placed fails to serve its proper function because it does not lie in the most dependent portion of what is frequently a very extensive defect. Uniformly satisfactory experience has, however, attended the use of such drainage; this is perhaps accounted for by the fact that we can, by changing the patient's position, make any desired portion of the cavity its most dependent one.

My experience with drainage leads me to conclude that where employed at all, it should sometimes be for a rather protracted



Fig. 226.—The apparatus by means of which steam is generated.

period. *Some* of my patients would have been better off had the drains been left in for one week rather than taken out (Figs. 231-234) at the end of one day as is usually done. Somewhere between these two extremes, lies the period which will ultimately be determined upon. A due consideration of *needle and suture* material will do much toward minimizing skin sears. As prophylaxis I here employ a slender noneutting straight needle No. 12, swaged onto a 0000 Chinese silk strand. This armamentarium is fine enough for large blood vessel suture; if applied without tension, then removed within 24 or 36 hours, positively no mark at all results from its use.

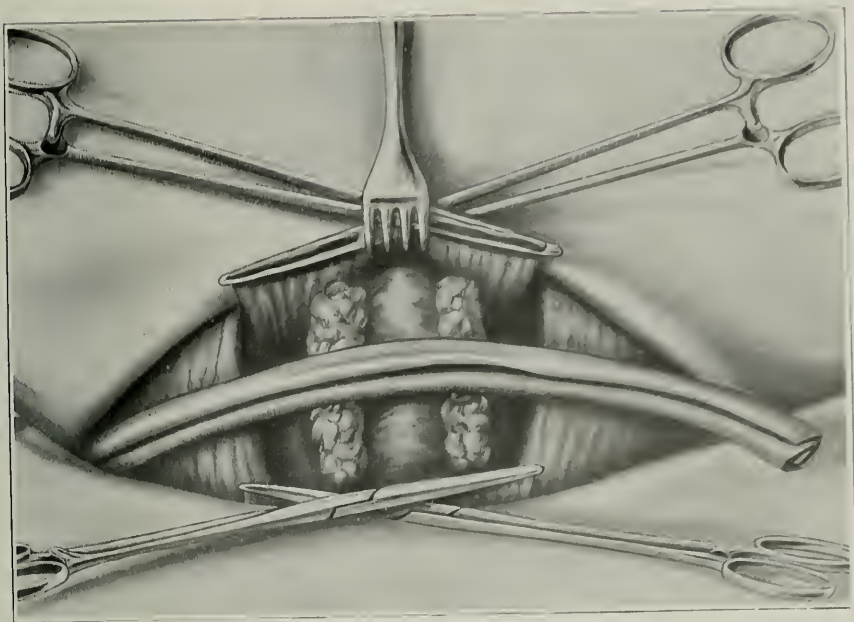


Fig. 227.—Strip of folded rubber laid across the defect in the thyroid gland.

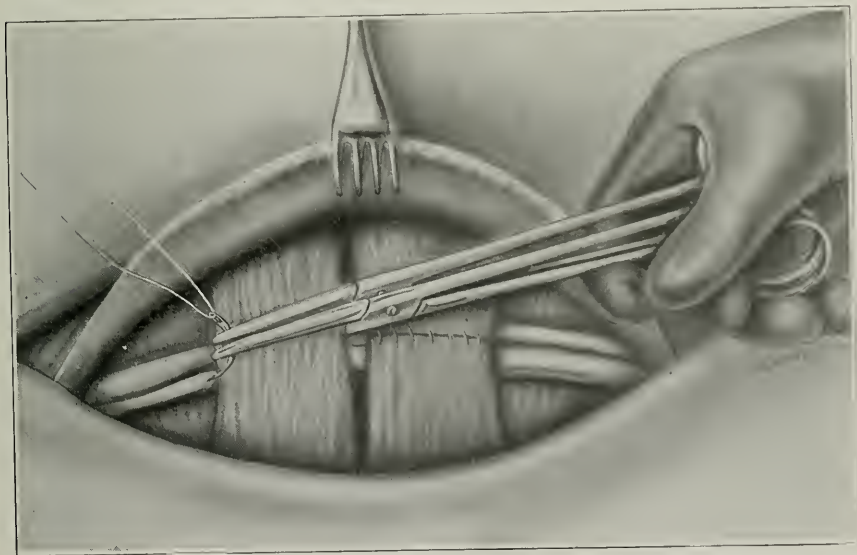


Fig. 228.—Reuniting the cross cut in the ribbon muscles over the drain.



Fig. 229.—Reuniting the ribbon muscles in midline.

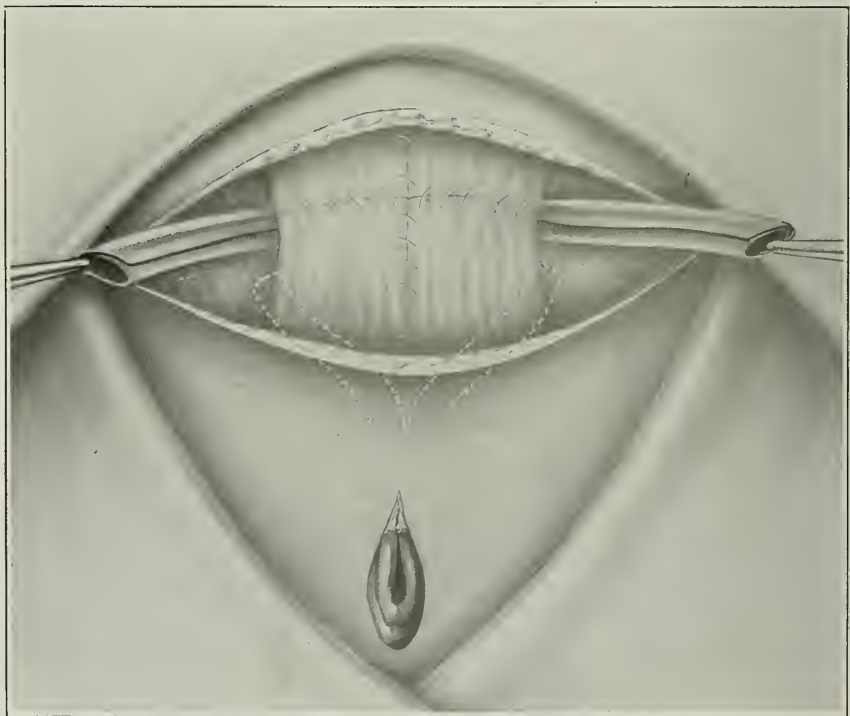


Fig. 230.—Position of through-and-through drain compared with that of the older type of midline drain.

Blebs filled with a brown serum are very prone after a few days to form in the line of incision. It is our practice to at once puncture (Figs. 235 and 236) the very thin skin which covers them, and press out their contents. This has to be repeated several times in some instances before one is fairly rid of the broken down blood



Fig. 231.—End of drain pulled out and cut off in such a manner that exposed portion is never drawn into the wound.



Fig. 232.—Drain removed after one exposed end has been cut off.

which escaped soon after the operation, into the plane between the reunited platysma and skin. Sometimes a glycerin pack (Figs. 237 and 238) does wonders by its osmotic action on these collections.

Paralysis of the Vocal Cord.—One of the most embarrassing complications which can follow thyroidectomy is *paralysis* of the vocal

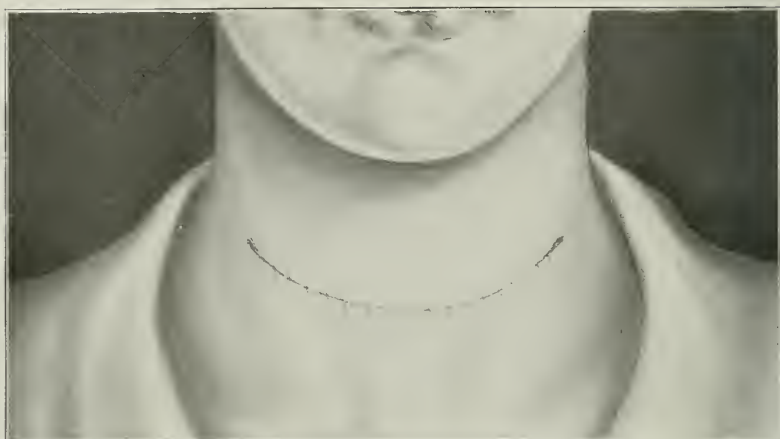


Fig. 233.—The neck as it appears a few hours after the drain has been removed.



Fig. 234.—Side view of neck after drain has been removed.

chord due to interference with the recurrent laryngeal nerve. If it appears immediately after the operation, the nerve has been cut or crushed by a clamp or tightly constricted by a ligature, and the prognosis must be considered doubtful.

There are instances on record of permanent paralysis from this cause. Still there is hope of spontaneous regeneration in any case as proved by the following very interesting observation of Dr. James,

who was practicing laryngology in St. Louis at the time of the cyclone in May, 1896. A patient of his was cut with flying glass, experiencing among other injuries a very deep one on the side of the neck. An immediate examination revealed complete paralysis of the vocal chord on the corresponding side. It is fair to suppose that its source of nerve supply had been completely cut off at this time. The functional disturbance persisted for almost one year,

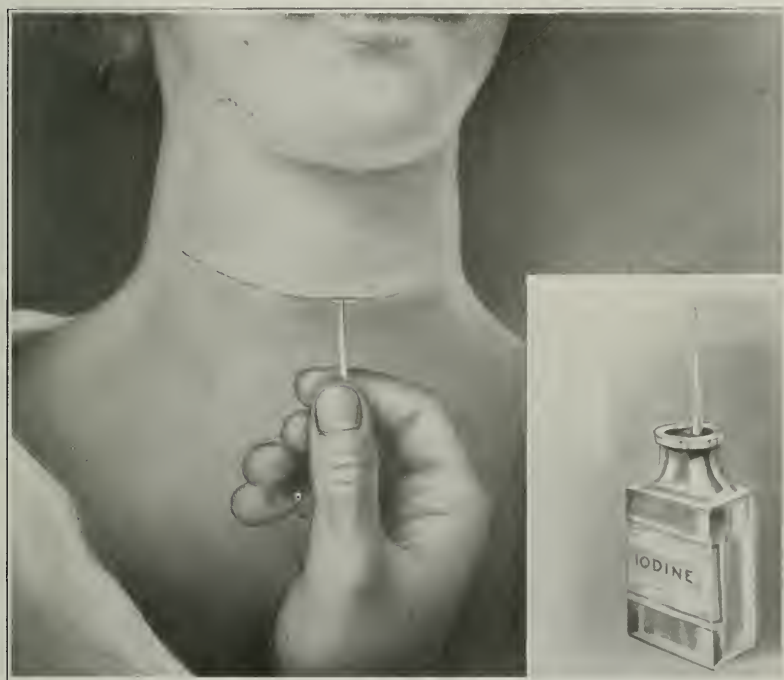


Fig. 235.—Puncturing a bleb with wooden toothpick as done at the Mayo Clinic.

when complete restitution was spontaneously established to the surprise of patient and physician.

Hoarseness often comes on during the few days which follow operation. Not infrequently this is caused by edema or the cellular infiltration which is part of the healing process, or sometimes by the pressure of confined blood, or of an exudate upon the recurrent nerve. The paresis which occasions hoarseness coming on secondarily, is not to be taken seriously, since it practically always disappears without treatment before the completion of the healing process.



Fig. 236.—Puncturing a bleb with sharp-pointed forceps.



Fig. 237.—A collection of serum after thyroidectomy.

Aspiration pneumonia occasionally complicates convalescence from thyroidectomy and as a matter of course is rather prone to appear in just these patients where paralysis of a vocal chord leaves the entrance to the air passages less than usually well guarded. I shall do no more than mention this complication here for the sake of completeness, since its treatment has been so fully considered in an earlier chapter on pneumonia.

Tetany is a very definite consequence of destruction or removal of all parathyroid bodies. This was a fairly common complication in the early days when total thyroidectomy was done by Billroth,



Fig. 238.—The same neck as shown in Fig. 237, after glycerin pack has been applied overnight.

Koehler, and certain other European operators. With the development of the subject the exact location as well as the functional importance of these tiny structures became understood and due consideration was afforded them on the operation table. A sufficient prophylaxis consists of leaving enough thyroid substance covering the trachea so that the entire region behind the gland remains undisturbed. This will obviate the possibility of parathyroid removal. Interference with their blood supply, too, has disastrous consequences. In most instances this is derived in great part from

branches of the inferior thyroid arteries, and for this definite reason I have given up ligating both of these vessels either as a preliminary measure or as a part of thyroidectomy itself. However, none of these considerations will prevent an occasional observation of this most distressing complication. I have seen it three times in the course of some hundreds of thyroidectomies, and in no instance was the whole thyroid removed or the inferior thyroid vessels ligated. Once tetanic symptoms appeared at intervals of a few minutes during the night following the operation and has never been observed since in this patient who is now in splendid health, one year later. I am unable to offer an explanation in this instance.

The second patient so affected was extremely restless after the operation and apparently had a ligature slip off of some small vessel, since the neck was enormously distended within twenty-four hours when we observed marked tetanic symptoms which disappeared immediately upon the release of the accumulated blood. Evidently increased pressure directly upon the glandules, or else upon their blood supply accounted for the complication.

In the third instance we experienced the only deep infection which we have ever seen in this work. The result was that tetanic symptoms appeared four weeks after the operation, the consequence, no doubt, of septic tissue changes in the parathyroids or in their afferent blood vessels.

Tetanic seizures are marked by tonic spasms of the flexor muscles of the forearm and hands. Sometimes the lower extremities, the face, neck and diaphragm are affected. In the one permanent case cited there was a distinct epileptiform phase to the malady, and in fact competent neurologists have disagreed for nearly a year as to whether this patient has an idiopathic epilepsy in addition to her tetany.

The treatment for seizures consists in the administration of morphine and bromide, while calcium salts if tolerated by the stomach will definitely prevent the attacks as long as given. I think it best to push calcium lactate and parathyroid feeding to the physiologic limit.

Myxedema occurs after the removal of practically all the thyroid tissue. It must be added that the gradual development of knowledge on this subject has shown that the persistence of a very small percentage of functioning gland substance will prevent its occurrence. This amount is decidedly less than was formerly thought necessary for the needs of the organism. The influence of the thyroid upon growth, development, etc., calls to our attention its rela-

tive importance during childhood, youth, and adolescence. This explains why a partial thyroidectomy should be postponed if possible, until the period of development is past, and why a relatively larger amount of the gland may with safety be removed in middle life than at a much earlier period.

I have seen myxedema only once in my entire experience. The patient, a girl of eighteen, experienced the removal of the right thyroid lobe with coincident ligation of the vessels entering the left upper pole. This complication must be suspected if the lower extremities commence to swell a few weeks after a thyroidectomy, especially if there are other symptoms of a thyroid deficiency, and if the edematous areas do not pit as is common in edema of the ordinary variety. Fortunately this complication is most readily amenable to thyroid feeding.

Scars, due to imperfect suture of the muscle planes or to improperly placed drain openings frequently so interfere with the functions of the trachea and neck muscles as to not only be highly disfiguring, but they lead at times to very considerable nervous symptoms. The usual mid-line drain through the original incision practically always produced an inequality of the wound edges. As a rule the upper lip rolls up, and while as a usual thing it becomes smoothed out in the course of months, occasionally this deformity remains permanent. In many instances, the drain track adhesion which runs directly from the skin to the deepest part of the wound leads to a marked deformity because the tissue planes can not readily slide over each other. There is at times a deep depression at the drainage exit point, and occasionally tracheal irritation in consequence of the cicatrix, having become attached to this important structure.

When my "through-and-through" tube is withdrawn, the skin edges coapt themselves so perfectly that an observer who sees the patient for the first time twenty-four hours later, is unable to tell whether drainage has been employed or not. It is needless to say that no sear at all is left, and that the medium portion of the wound looks altogether different from those which have been drained in the old way.

As a prophylactic measure against needlessly disfiguring skin scars, it has long been my custom to mark the neck before operation, the patient being in the sitting posture wearing the string of beads which is intended later to cover the sear.

I endeavor to prevent formation of connective tissue deep in the neck by stretching instead of cutting the ribbon muscles, in all but the largest goiters and those removed under local anesthesia.

Asymmetry characterizes the appearance of the patients on whom the older unilateral operations were done. This is different now since all surgeons who are devoting study to this line of work do a bilateral lobectomy if there is appreciable enlargement on the second side and if the patient can endure it.

In *Surgery, Gynecology and Obstetrics*, 1917, under the title "Subtotal Thyroidectomy," I described a procedure which has symmetry as one of its ultimate aims.

Recurrence of goiter after a unilateral operation is not at all uncommon. I have seen it very few times in the various forms of simple goiter; but very much more frequently in hyperplastic intoxication cases. In fact this can be prevented only by due consideration of the second side at the original operation. If it appears normal, a generous portion of it should be "bitten" out, thus decreasing its size by about one-half, but if it is enlarged, a relatively greater amount must be removed by resection or subtotal lobectomy if prophylaxis against new growth and against a recurrence of toxic symptoms is to be effective.

Since the treatment of hyperthyroidism merely begins with the operation and hospital stay, Dr. Stuart McGuire is in the habit of handing these patients when they go home the following printed directions:

The full benefit of your operation may not be experienced at once. Your improvement should be progressive, but you can do much to get well and stay well by observing the following instructions:

It is important to avoid undue mental excitement and physical overstrain. If anything worries you, put it off. If you get tired, stop and rest.

Get an abundance of rest by going to bed early, getting up late and taking a nap in the afternoon.

Fresh air day and night is important. Sleep with the windows open. Be careful, of course, to avoid cold by being comfortably clothed or covered.

Use nothing that irritates the nervous system. Tea, coffee, alcohol and tobacco should be avoided.

Your diet should be generous and wholesome. It should be adapted to increase your weight. Eat white meat sparingly and avoid red meat entirely. Do not take beef tea or meat broths.

Live principally on milk, buttermilk, cream, butter, bread, cereals, fresh vegetables and cooked fruit. Grape juice and other drinks prepared from fruit will be found palatable and beneficial.

Drink an abundance of water. If there is any doubt as to its purity, boil it for twenty minutes and allow to cool before using. Distilled water is desirable if it can be obtained.

Take regular but moderate exercise.

The bowels should be regulated as far as possible by natural means, such as water, food, exercise and the establishment of a regular hour of going to stool. Occasionally a mild laxative may be necessary.

If in doubt about anything, consult your physician, who has been acquainted with your condition and advised as to the treatment you are desired to follow.

Please report your condition by mail at the end of three months. If you are well, the information will help us; if you are not well, we may be able to help you.

Neck Gland Dissection.—These operations are not nearly so frequent as they once were, because of the fact that hygienic and specific forms of treatment have assumed such an important role in connection with these cases. The incision shown in Figs. 239-241 is recommended.



Fig. 239.

Fig. 240.

Fig. 241.

Fig. 239.—From the front is seen only the lower part of the incision which is hidden by the collar.

Fig. 240.—One must admit that the upper half of the incision is seen if one is standing to the side of the patient.

Fig. 241.—The upper third of the incision is so far back as to be invisible to an observer who faces the patient.

Lymph drainage must be given due consideration after a dissection of any one of the regions rich in lymph nodes since the operation involves a division of numerous lymph channels, and lymphorrhagia does not cease for several days.

Certain caution must attend the use of glass tubes or even of rubber tubes, since decubitus of blood vessels is frequent enough to be very well known in this connection. It is our custom to employ soft rubber rolled up or folded, brought out invariably through a stab wound which permits the complete enclosure of the original incision. It is a good working rule to leave drainage material in place until the wound is relatively dry, it being difficult to establish

a date for the removal of drains in a given instance on account of individual differences in patients.

Chylous fistula occasionally complicates an extensive dissection of the lower triangles of the left neck. For details in this connection the reader is referred to the chapter on *Fistulæ*.

The *spinal accessory* nerve is not infrequently divided during the course of these operations. It is not impossible for an experienced operator to preserve continuity of this nerve under conditions at all approximating the normal. This is merely a question of judgment and it will be granted by any one of experience in this field that the time consumed in certain instances in carefully dissecting out the nerve adds to the operative risk so much as to render the procedure inadvisable. A disagreeable consequence of dividing this nerve is shoulder drop from paralysis of the muscles involved, but the deformity is not more noticeable than is the asymmetry evident in so many individuals whose occupation compels them to habitually hold one shoulder higher than the other for a great part of the time. The substitution of other muscles for those paralyzed enables the individual to lift the affected shoulder sufficiently for all practical purposes.

Anesthetic areas follow the extensive division of superficial nerves affected by the skin incision, and while these are a source of marked temporary discomfort to highly organized patients, they disappear in the course of time through spontaneous substitution for the small branches affected by neighboring skin nerves.

One of the most interesting as well as annoying subjective symptoms of which these patients complain is the indescribable *aching* occasioned in the cervical and upper dorsal regions by excessive muscle fatigue due to the constant effort of the patient to protect the extensive wound by holding the neck rigid. This is possibly best described by the patient's complaining of the sensations which he experiences when he takes the first long walk of the season while wearing his heaviest winter overcoat. The relaxing warm tub bath, warm applications, and general massage, afford the greatest measure of relief.

Loss of the sternomastoid muscle occasions a marked deformity, but there are cases in which periaadenitis with *fistulæ* into and through this important muscle make its removal with the gland mass a much more feasible procedure than is a prolonged attempt to save it. The same deformity has resulted in every case in which I have divided the muscle transversely and then sewed it together after completing the dissection.

It is a surgical axiom that the muscle can be so treated above the entrance of the spinal accessory nerve without untoward consequences, but, in my experience at least, this is not proved true, the substance of it having undergone a metamorphosis into fibrous tissue with a cosmetic effect very similar to total removal of it.

The *rigidity* of the very lengthy scar which permits a blood dissection of the neck is frequently quite annoying for a few weeks. In the course of time these scars tend to soften up spontaneously, but I know of nothing which tends so to hasten the procedure as a few x-ray exposures in competent hands. Where this treatment is not available, considerable comfort, possibly of psychic nature, will be afforded the patient by warm baths and the application of cold cream, especially with massage.

Minor local *recurrences* are very frequent after the most extensive dissections. This has, no doubt, had an influence in decreasing the frequency of these operations. Such recurrences are easily explainable on the ground that no dissection, no matter how complete, ever can effect the removal of all the lymph nodes in the neck, by reason of the fact that many of those which are affected have not yet attained macroscopic dimensions.

The *extension* of tuberculosis from the neck gland to the lungs or other parts of the body is not at all common. These are, as a rule, strictly local infections and remain for a long time well localized. I have more than once removed affected tonsils at the same sitting and found both miliary tubercles and tubercle bacilli in them. That the process, however, does occasionally extend to other lymphatic regions is shown by the fact that I have in one instance at least at four sittings made thorough dissections of both cervical and both axillary regions with such satisfactory results that the patient seems to be in perfect health as this is written many years later.

Laryngectomy.—Extensive phlegmons are one of the most common complications after laryngectomy. There is no difficulty about the diagnosis. Where they are at all superficial, treatment follows the line usually laid down in such emergencies.

Aspiration pneumonia is rendered very much more likely in any instance where the protection of the epiglottis is removed from the upper air passages as it frequently must be in the course of this operation. Of course, the same thing is true of an open trachea attached to the outer surface of the neck.

Interference with the *functions of the heart* sometimes follows these operations when the two vagus nerves are traumatized with

the immediate liberation of depressor vagus impulses. A large dose of atropin will inhibit anything of the kind, hence the administration of it constitutes the most important prophylaxis which can be observed in this connection. A similar physiologic injury to the heart follows mechanical irritation of the laryngeal mucosa, but fortunately it can be wholly anticipated by preliminary cocaineization of this surface, another prophylactic measure which should never be neglected.

Secondary hemorrhage occurs in these cases as in all others where phlegmons occur in the vicinity of external carotid branches which have been divided at the operation. Such hemorrhages are almost universally fatal, although frequently this unhappy result follows several repetitions of the bleeding. The only therapeutic measure which will forestall this unhappy termination is secondary ligation of the common carotid artery. For details of this subject the reader is referred to a study of it by the authors published in the *Annals of Surgery* for June, 1917.

The *functional results* of laryngectomy so far as respiration and even speech are concerned, are much better than one would have reason to suspect, judging only by the gravity of the operation. The sufferer learns to use the muscles of the roof of the mouth in phonation as a partial substitute for the important structures which have been removed. An operation which involves but half of the larynx leaves in many instances almost no appreciable functional vocal defects.

CHAPTER LXV

OPERATIONS UPON THE THORAX

By Willard Bartlett, St. Louis, Mo.

Rudolph Virchow always termed the brain, heart, and lungs, the three vital organs. Since the thorax contains two of the three, it stands to reason that the surgery which tends to prevent or correct any interference with their functions must be a matter often of urgency and always of importance. In addition, we have to consider under this heading the after-treatment and various conditions which affect the breast and axillary regions.

Abscess of the Breast.—One would presuppose the after-treatment of this subject to have been antedated by through and through drainage which we consider the only correct operative treatment for abscess in this region. Without going into technical details it must be mentioned for the sake of elucidating what follows, that I introduce through short incisions (Figs. 242-246) radiating from the nipple, a split rubber tube or a folded rubber dam in such a way as to completely traverse the abscess cavity, entering at one periphery and coming out at the point most distant from and opposite to the first.

Since acute breast abscess almost always originates in a nipple infection, it stands to reason that the *nursing* on the affected side must be *discontinued* as soon as the lesion is discovered, for the protection of both the patient and the infant.

No better treatment of the nipple with its fissures, which are the probable port of entry for germs, can be imagined than hourly bathing with *alcohol*. It must in addition to this be kept perfectly dry between times and shielded from the contact with clothing or bed covering.

Complete *rest* for the breast itself can be secured only with a patient on her back in bed. This is essential because in any other position the heavy organ drags on its attachments and circulatory disturbance is thus entailed. It is important that the arm on the affected side be slightly elevated on soft pillows and gently confined to one position. This can most readily be accomplished by a band around the wrist which is attached to some portion of the



Fig. 242.—Two short incisions radiating from the nipple are made at the periphery of the abscess.



Fig. 243.—A forceps is thrust into one incision, through the cavity and out the other.



Fig. 244.—In withdrawing the forceps, a strip of folded rubber is drawn in, completely traversing the cavity.



Fig. 245.—The ends of the rubber are fastened together so that it can not slip out.

bed. In this way the axillary lymphatic nodes are protected, whereas if the arm is freely used the lymphatic circulation is hastened and toxic material driven beyond the affected region.

During the acute period the *wound* is kept *open* instead of being covered with any form of dressing which may become a pus poultice, and is exposed to the rays of a powerful incandescient lamp two or three inches removed under the same therapeutic conception as noted heretofore in the treatment of other inflammatory lesions.

As soon as there is no longer any systemic disturbance as evinced by normal temperature, pulse, white cell count, and sensibility to



Fig. 246.—A simple method of fastening the ends of the drain together with a safety pin.

touch, the *patient* can be *up* and about. It is now most important that the breast be supported by a bandage which is suspended about the neck, running under the opposite axilla in such a manner as not to cause any annoying pressure symptoms.

The original split rubber tube or rubber dam *drain* may be *withdrawn* (Figs. 247 and 248) just as soon as the discharge becomes less purulent and commences to manifest a serous character. In doing this I invariably draw into the wound at the same time a number of eords (Figs. 249-252) which keep the wound open until the drainage has practically ceased. One of these is withdrawn every day or two, and finally the last one has kept patent such a narrow channel that even though its two ends suddenly block up

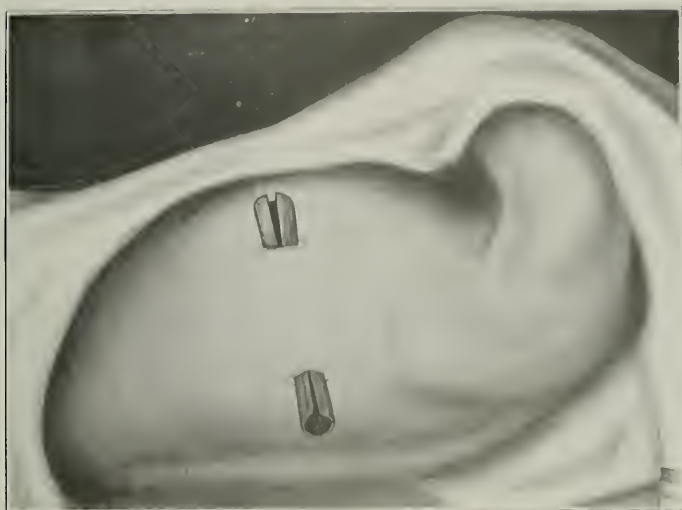


Fig. 247.—The ends of the tube have been freed for removal. Unfortunately the openings have been illustrated too far to one side; however, the principle is the same.

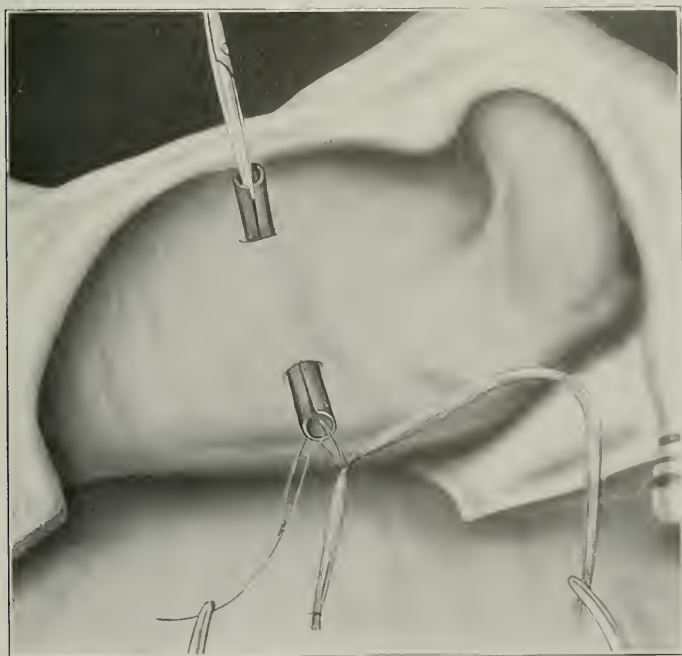


Fig. 248.—Strands of silkworm have been attached to the end of the tube and will be drawn in as the other end of the tube is drawn out.

when the cord is removed, there is little danger of enough fluid accumulating to distend it into a pocket which will cause further symptoms (Figs. 253 and 254).

Benign Breast Tumors.—After the removal of small isolated tumors which, upon microscopic examination prove to be benign, no treatment is required other than the removal of stitches and the occasional pressing out, or the exhaustion by Bier's cups, of serous or liquid fat *accumulations*.

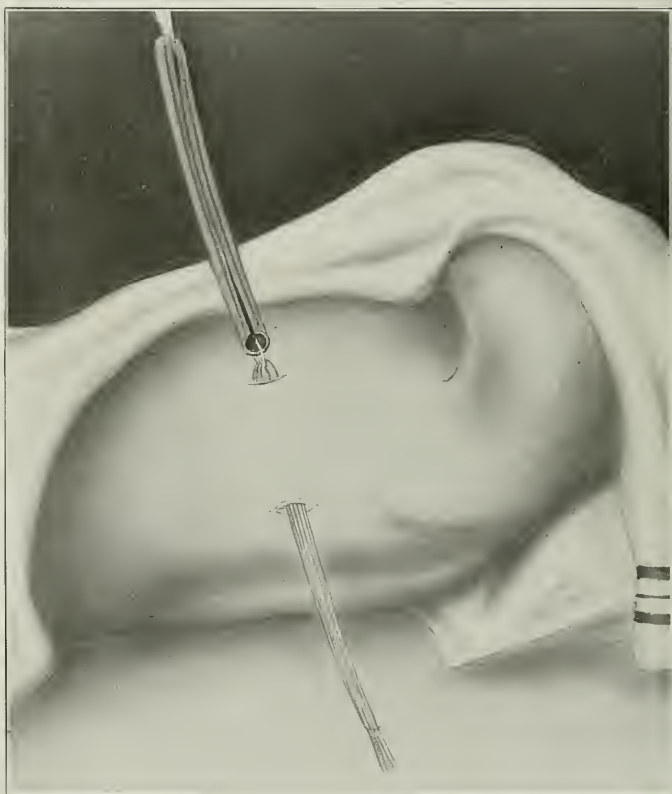


Fig. 249.—The silkworm strands in place to take care of serous drainage.

The real problem in this connection concerns itself with the complete removal of gland substance necessitated by chronic *fibrocystic mastitis* that diffuse disease characterized by the appearance of multiple nodules throughout the parenchyma which is differently designated by the various writers.

We will presuppose that a semicircular incision (Fig. 255) has been made below the breast hidden in the skin fold, that the entire

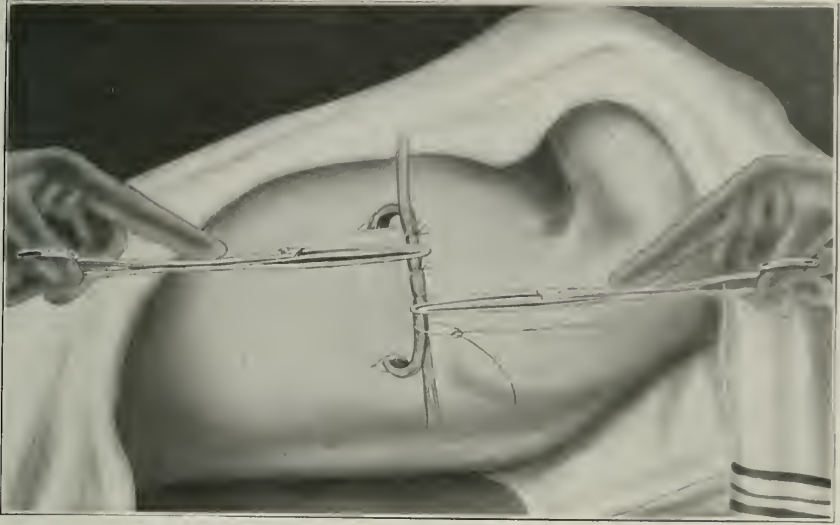


Fig. 250.—The ends of the bundle are crossed and cut off short after they have been tied together at several points.

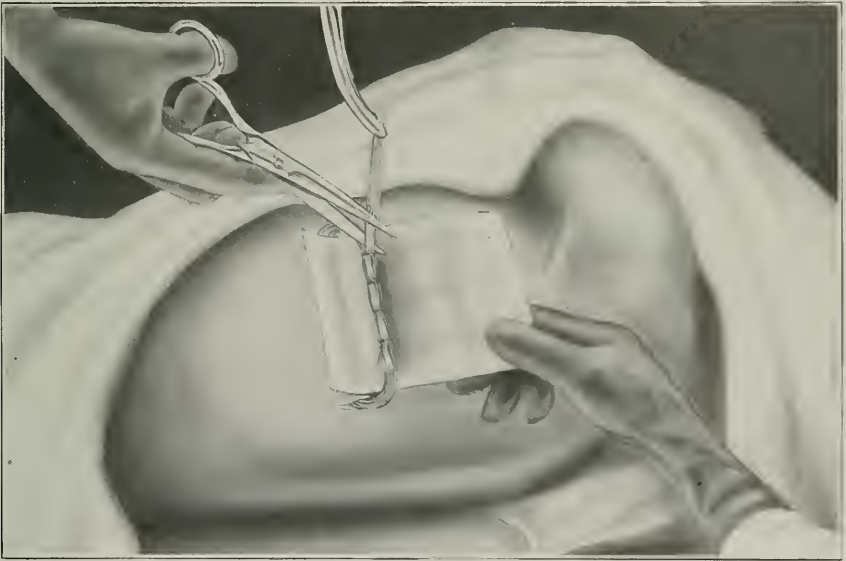


Fig. 251.—The rough-bundle is wrapped with adhesive to protect the patient's skin.

gland bearing substance has been turned upward and removed (Fig. 256) with a cautery without injury to its skin covering. (This should never be done with any cutting instrument but always with the cautery, since in a precancerous lesion of this kind there

exists the possibility that some portion of the growth may be involved in an early malignant change. If the cautery is very hot and the correct technic is employed, the surrounding tissues are not devitalized and so little eschar is left that the trained observer can scarcely tell what instrument has been employed in the removal.)

Just at this point the after-treatment becomes a part of the operation, hence, the two can really not be separated as is usually possible in a consideration of this kind. A careful estimate is made of the dimensions of the mass removed and a *free fat transplant* of approximately 25 to 50 per cent greater bulk is removed from



Fig. 252.—The completed drain, which is left in place until discharge has practically ceased.

the midline of the lower anterior abdominal wall (Fig. 257) or from the outer aspect of the thigh, is folded up, stuffed into the defect and covered by two rows of sutures (Fig. 258).

I have done this many times with the most gratifying results.

The chief complication in connection with any plastic operation on the breast is a tendency to prolonged slow *hemorrhage*. The blood supply is so rich and frequently so greatly increased during the progress of this especial malady that considerable technical difficulty is presented in its control. Such bleeding is never alarming, but unless prevented as far as possible may prejudice the success of such an operation.

Prolonged drainage is inadvisable, since it was shown long ago by J. G. Clark that skin germs find their way down such drains into

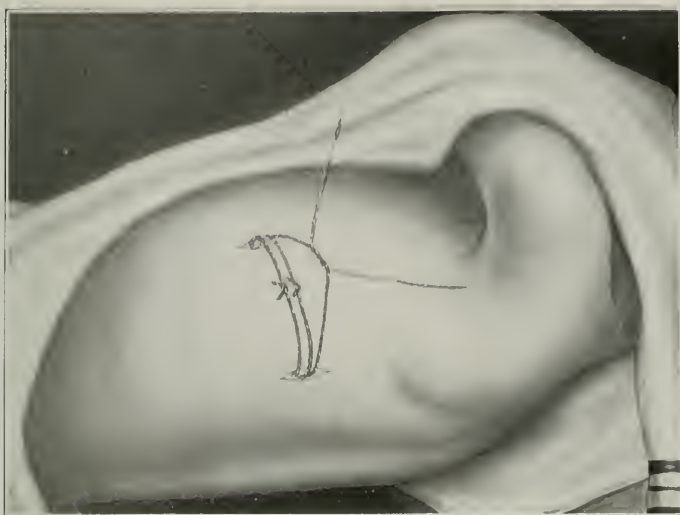


Fig. 253.—Instead of silkworm a few strands of heavy silk may be drawn in and tied separately.

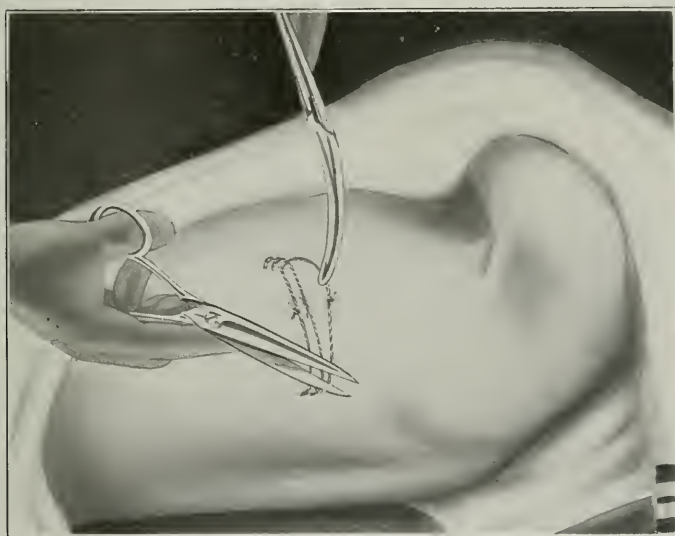


Fig. 254.—The silk strands are removed separately so that the final drainage canal is represented by the size of the last silk strand.

the depths. I have preferred to allow *accumulations* of moderate size which are causing no serious symptoms to break through under the hygroscopic influence of glycerin applied as a moist pack, and have at times aided the escape by gently producing a tiny separat-

ing of the wound edges and expressing the fluid. Here again momentary suction into a Bier's cup is of value.

It has been remarked earlier that the free fat transplant should be about 25 to 50 per cent larger than the mass removed. One is therefore prepared for the statement that a certain amount of *liquid fat discharges* itself from such a wound early in the convalescence. When this occurs it should be treated in just the way indicated for accumulations of blood or blood serum indicated in the preceding paragraph. No doubt, liquid fat is absorbed,

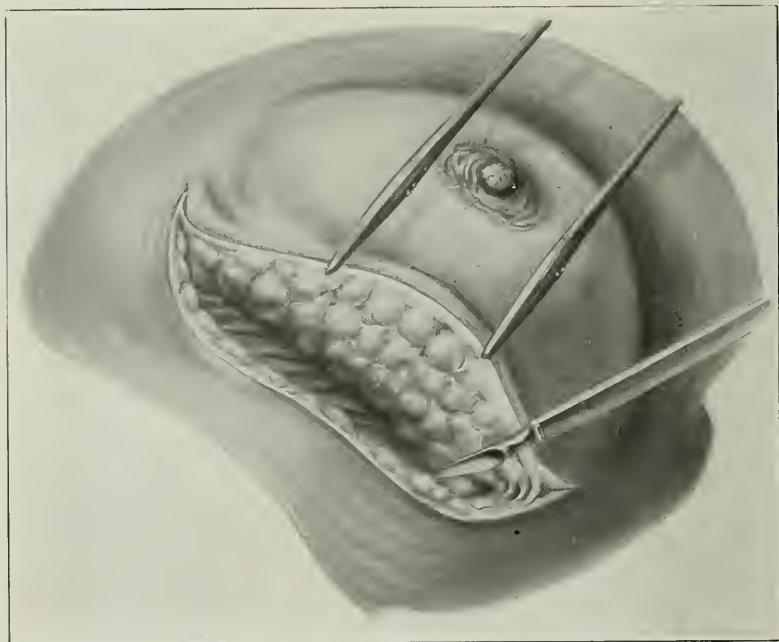


Fig. 255.—The primary semicircular incision beneath the breast.

since a further shrinkage of the reconstructed breast takes place for some weeks following the complete closure of the wound. At the expiration of several months such a breast seems to have attained its normal, and provided it has been made large enough in the first place, bears a striking resemblance to its mate.

One who has had no experience with this kind of surgery but who has seen women apparently resigned to the mutilation of an ordinary breast amputation is scarcely prepared for the enthusiasm which our patients have manifested for these reconstructed breasts; it seems reasonable to suppose that it will become easier

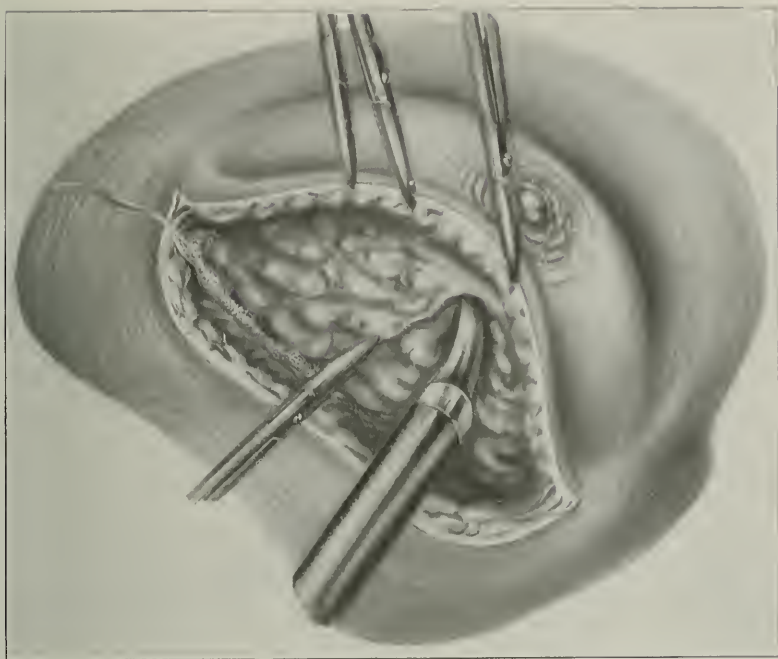


Fig. 256.—Removal of gland substance with the cautery.

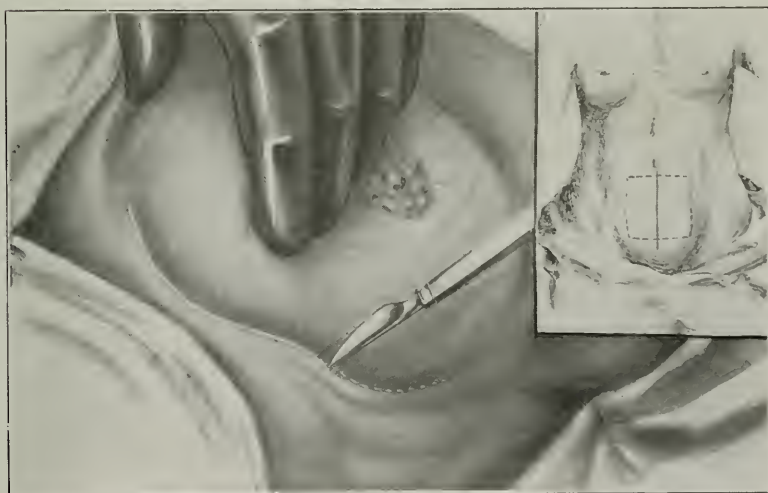


Fig. 257.—Marking line of intended incision. The insert shows method of estimating the amount of abdominal fat required for the transplant.

in future for women to consult the surgeon early in the history of breast tumors if this phase of the subject in as far as it affects the nervous system be given due consideration.

An *unsightly scar* on the breast as on any other situation to which the patient's attention is so easily attracted is a matter deserving of consideration, hence the importance of the semicircular scar below the breast exactly in the skin fold and covered by the pendulous organ when the patient is in upright posture. She can neither see it directly nor when she looks into a mirror.

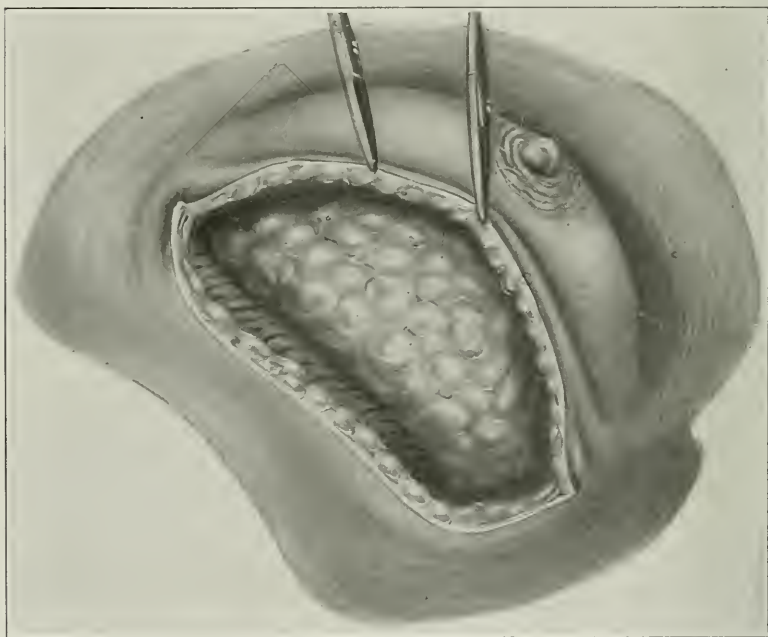


Fig. 258.—The fat transplant in its new position.

Malignant Tumors.—Let us presuppose an extensive removal of skin, subcutaneous fat of the breast, the pectoral muscles, and axillary lymphatic structures to have been done (I use and advise electro cautery for all but the skin), and we are ready for the after-treatment.

Strange as it may seem, these patients do better, after such an extensive surgical procedure, if they are got *out of bed* within two or three days. This not only has a beneficial influence upon the functions of the respiratory apparatus, but they are thus enabled

to make the affected arm, shoulder, and side of the thorax more comfortable.

Drainage of serous material is always prolonged, as a result not only of the extent of the planes of tissue division, but of the fact that a very large number of lymph channels have been divided in the dissection of the axilla where lymphorrhagia does not cease

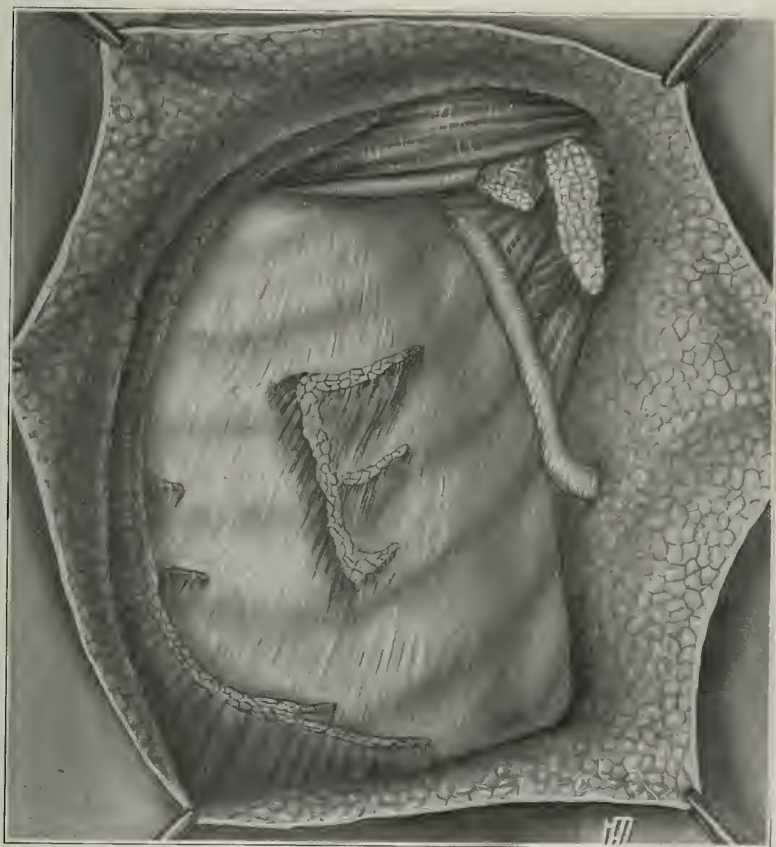


Fig. 259.—The drain in place in the axillary space.

spontaneously as a result of thrombosis for several days. It is our custom to use a split rubber tube or folded rubber dam (Fig. 259) which is allowed to emerge through a stab wound in a dependent region (Fig. 260) until the drainage has materially decreased in amount.

Necrosis of the skin flaps delays the convalescence and increases the period of invalidism more than does any other complication

which is observed in these cases. Four factors, all of them avoidable, have singly or in combination seemed to us to produce this ill effect. They are wound infection, division of the flap, chilling of it, undue skin tension.

The first of these four needs no elucidation. Two large flaps, no matter what the direction of the incision, are much more likely to live than are any number of smaller triangular ones (Fig. 261) fashioned by any of the methods proposed to facilitate wound closure.



Fig. 260 —The drain emerges through a stab wound in the posterior axillary line.

Blood supply to the apex of any skin angle is sure to be so imperfect that necrosis of a portion takes place. Another prophylactic means of insuring the integrity of a flap is to maintain its direct contact with the warm chest wall for as much as possible of the time devoted to the operation. This prevents the chilling which we have found to be distinctly harmful. Sutures which are drawn too tightly in an effort at complete closure are certain to cut off blood supply and otherwise prejudice the vitality of any flap.

Secondary *skin grafting* is of the greatest value in shortening convalescence if the defect has not been entirely covered at the operation, or if skin necrosis has taken place. After trying every

method of partial and complete grafting at various periods after operation, I arrived at the conclusion which is, of course, not new to many, that it is better to wait until all sloughs have disappeared and until the field is completely covered by a carpet of uniformly smooth granulation tissue (Fig. 262) and then to graft it entirely at one sitting. This is done with the greatest ease after an area of the proper dimension on the thigh has been anesthetized with one-half per cent novocaine according to the Braun technic. A detailed consideration of skin grafting belongs to the works on



Fig. 261.—Triangular flaps may be saved by letting venous blood out through small stab wounds.

operative surgery, hence it will suffice here to advise that such grafts be not wider than two or three centimeters, that they be held rigidly in place for the first twenty-four hours by a gutta percha covering, but that the *wound be kept open* while protected by a wire gauze frame.

Where a portion of a *graft* becomes *lifted up* by a collection of serum or pus underneath it, this must be punctured and very gently expressed. In fact our best results after secondary skin grafting have resulted from the hourly attention of an experienced nurse who

has employed a needle or sharp pointed bistoury as often as a bleb has appeared.

Distinctly the best treatment for the *surface* from which a graft has been removed consists in the application of a sheet of gutta pereha for the first twenty-four hours during which there is continuous oozing and later exposure of the area under a wire gauze protector. During the second twenty-four hours such a wound becomes perfectly dry and will then not be affected by light contact with the bed clothes, etc.

The *arm* always *swells* after a thorough dissection of the axillary lymphatic structures. This occurs, as a matter of course, because

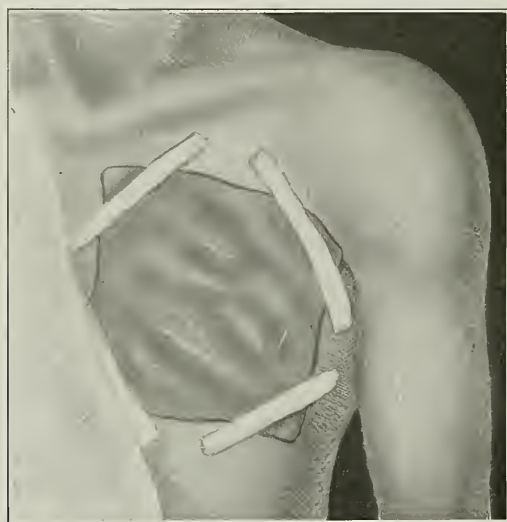


Fig. 262.—A granulation tissue surface protected by rubber tissue from gauze dressings while being prepared for secondary skin graft.

the lymphatic channels from the arm as well as from the breast drain into the lymph nodes which are removed as a routine procedure. It has long been our custom to save the patient any unwelcome surprise of this kind by warning her before the operation that a dissection thorough enough to benefit her is likely to bring about this unpleasant result, giving her at the same time the exact explanation of it. As a matter of fact no treatment is of any marked avail, still women derive a certain amount of satisfaction from warm baths, massage and an application of various fatty substances which they imagine will “soften up” the lymphedematous tissues.

Impaired functional mobility at the shoulder joint is a complication of importance second only to a local recurrence of the growth. This has in my experience resulted from three causes, all of them being unfortunately in a large measure under my own control.

1. The original incision should never be so placed as to result in a skin scar near the joint.

2. The four directions outlined above for the prevention of flap necrosis will prevent the formation of scars which will cripple the joint.

3. The arm should never under any circumstances be confined in the original dressing (Figs. 263 and 264) and the patient must begin

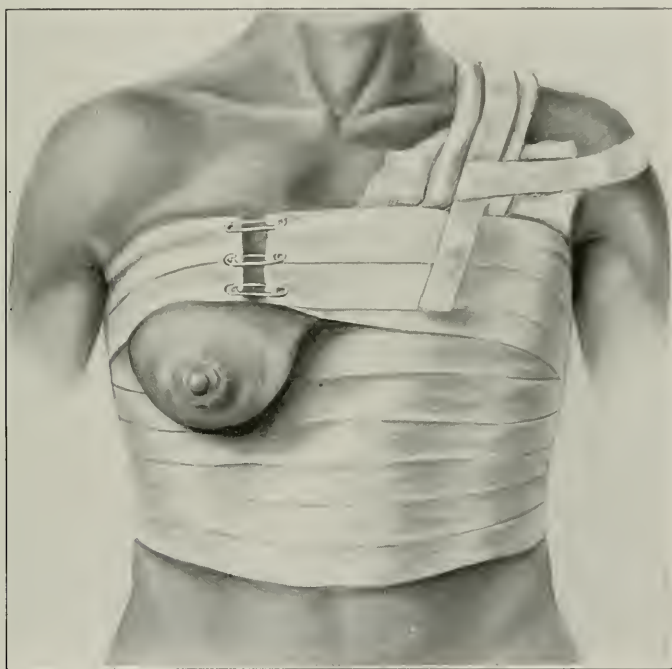


Fig. 263.—A form of breast dressing which allows the affected arm perfect freedom of motion.

to make some slight movements with it as soon as she awakes from the anesthetic. Within a few days she must be feeding herself with the affected extremity and at the end of a week arranging her hair with it (Fig. 265). Her chief difficulty will be experienced in getting her hand above her head, hence, she should mark on a door frame the height to which she can reach about the tenth postoperative day and then with the body perfectly erect force her hand one

inch higher on every successive day until her capacity for this form of endeavor is equal on the two sides (Fig. 266).

Unless the patient is constantly reminded by the physician, nurse, and relatives of the danger of a "stiff arm," and is fully acquainted with the fact that she can by her own efforts alone escape this calamity, there is no possibility of the functional result being all that could be desired. The psychic side of the after-treatment in this field of surgery can hardly be overvalued.



Fig. 264.—A towel bandage which fixes a breast dressing and allows the arm entire freedom.

Newspaper advertisements and other misstatements have rendered the average woman with a tumor in her breast a ready victim to all sorts of *emotional wear and tear*. It is rather better to gain the confidence of these unhappy individuals by concealing nothing from them, but, on the contrary, by acquainting them with reliable statistics and trying if at all compatible with truth to assure them that an early operation in the given instance promises more than enough to justify the risk, suffering, and expense entailed. The



Fig. 265.—This illustrates the amount of movement which must be given the affected arm on the various postoperative days if no impairment of the shoulder joint is to result.

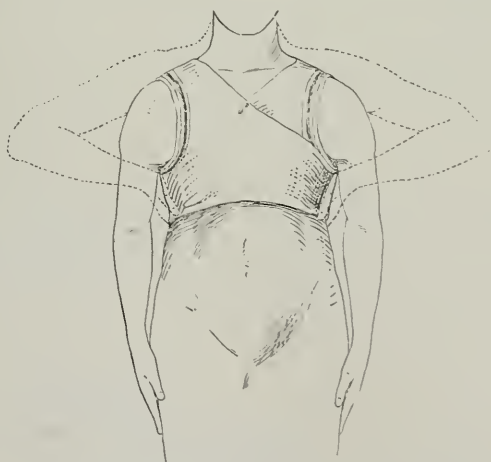


Fig. 266.—This suggests a form of bilateral exercise in which the patient should indulge to insure using the shoulder joint of the affected side.

mere fact that the woman who has undergone this operation is observed by her surgeon every thirty days gives her a feeling of security. She knows that she has an advisor who is at least careful and painstaking and reasons that in the event of recurrence she will be afforded whatever help there may be at hand without the loss of precious time.

It is a certain source of comfort to a woman contemplating this operation, to tell her that a *pad* the size of the breast can be worn after the operation with cosmetic results so satisfactory that no one who sees her fully clothed will ever suspect that a breast has been removed. In fact I can not remember to have detected any asymmetry in patients of this type who have called upon me after leaving the hospital.

The matter of *recurrence* is one which can only be mentioned here. There are many obvious reasons why statistics are of only relative value in this connection. The after-treatment can, of course, not concern itself with distant metastasis, since nothing more than temporary relief can be afforded by it.

Regionary recurrence in the cervical triangles of the affected side has practically never been successfully treated by operation. Bruns long ago found the mediastinal lymph nodes presenting a coincident involvement in almost every instance, hence advised against what must obviously be a partial operation.

Recurrence in or near the *skin* scar means involvement of the thoracic wall at the time it is detected, and while I have done extensive resections of the entire chest wall with results which were satisfactory from an operative viewpoint, still I have never cured a patient, hence can not recommend the procedure. Exposure to x-ray and radium no doubt offer the most likely solution of this problem, although I can not say that they justify any rosy anticipations.

Empyema.—The pitfalls which await the feet of the surgeon who is inexperienced in the management of this kind of cases, are vividly called to mind by Dr. Samuel Robinson's discussion of the subject at one of the meetings of the Surgical Section in the American Medical Association.

Dr. Robinson stated that every chronic pneumothorax is to be laid at the door of the man "who does the original operation for acute empyema." This is sufficient to call to mind the fact that there are two ways of treating this condition; the one of them curing the patient in a short time, the other one affording temporary par-

tial relief, but transforming the acute condition into one of a chronic nature which renders invalidism a certainty and death more than a possibility.

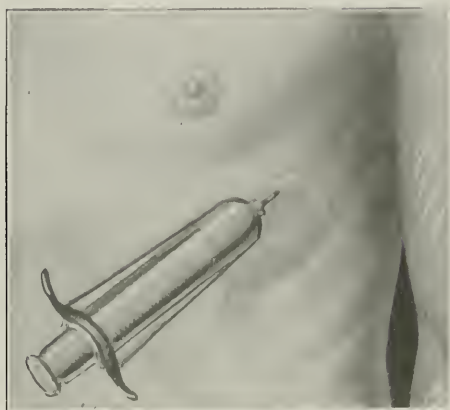


Fig. 267.—Infiltration of the chest wall about the rib or interspace to be utilized.

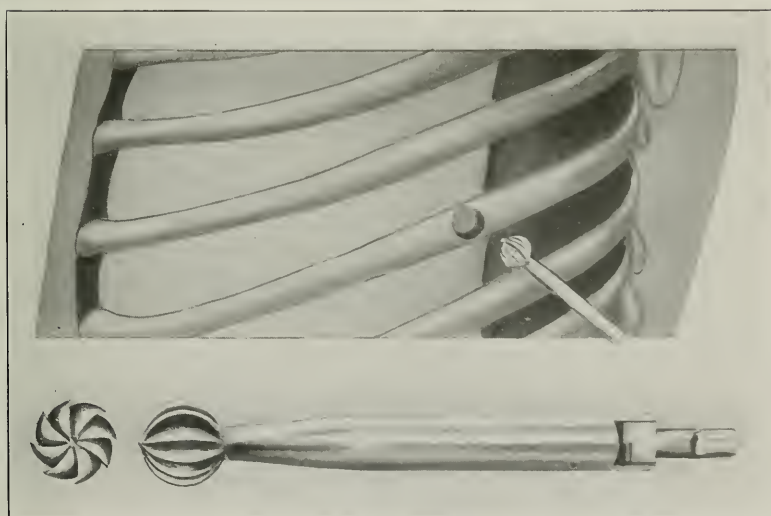


Fig. 268.—Drilling through a rib for the introduction of a drainage tube.

The after-treatment as I practice it, is a direct continuation of the original operation, hence I feel that a short technical description will facilitate a more complete understanding of what follows.

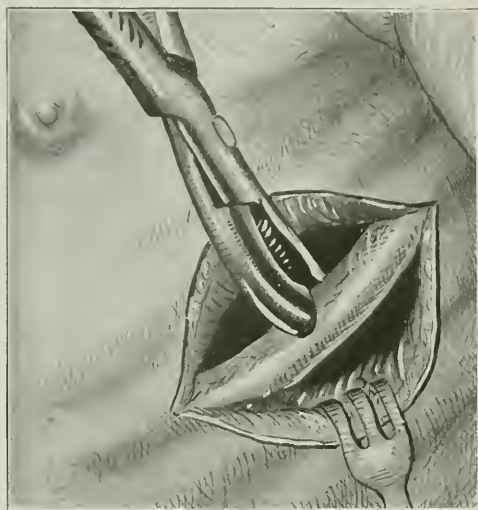


Fig. 269.—Biting out a groove for the tube.

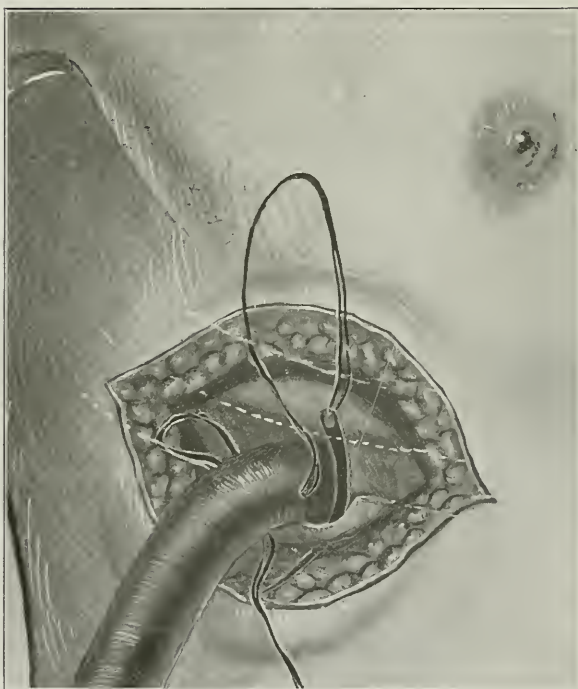


Fig. 270.—Attaching the tube by a silk suture around the rib.

The treatment of a pus collection in many parts of the body is a matter of drainage and that is all, since soft parts allow the early collapse of the ordinary cavity wall with consequent obliteration of the dead space. There are two physical reasons why this happy end is not readily attained after the liberation of pus in the pleural cavity; namely,

1. Rigidity of the chest wall.
2. Tendency of the lung to shrink up with every inspiratory effort.

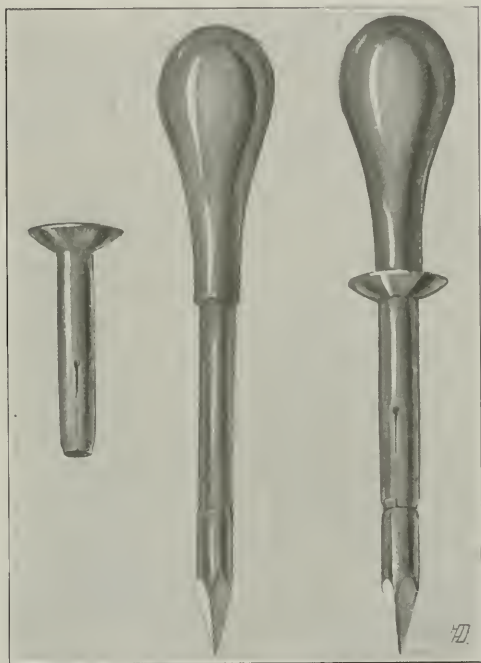


Fig. 271.—A trochar and cannula for introducing tube through intercostal space.

The one, an anatomic, and the other a physiologic consideration, must be fully grasped before any operation is attempted, since a proper understanding of them alone leads to immediate success in this field, while any other course means ultimately chronic pneumothorax.

We have then before us double indications: the liberation of the accumulated *exudate*, as well as the *inflation* of the compressed lung to the extent that it shall completely fill out the affected pleural cavity. It is a too little known axiom of chest surgery that an opening in the chest wall smaller than the interior of the larynx is a

sine qua non, as every inspiratory effort causes the lung to inflate rather than to collapse. With this underlying principle guiding us we for years (using local infiltration) have drilled (Figs. 267 and 268) through a rib in the most dependent portion of the chest wall and inserted a very few centimeters of a rubber tube which exactly fitted the opening. The rib was so frequently fractured, however, that we have more recently rongeured out enough of the upper edge of a rib (Fig. 269) to allow the introduction of the same tube (of

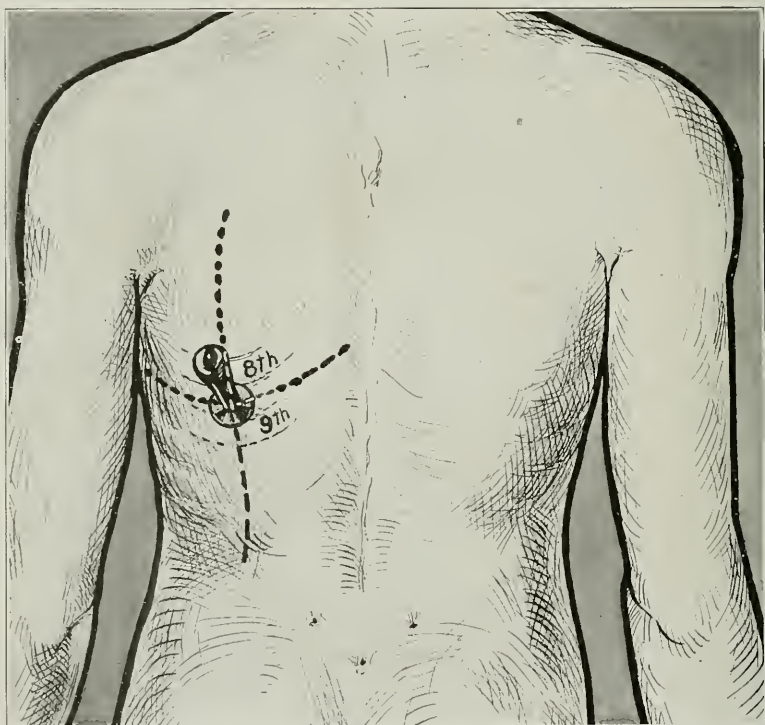


Fig. 272.—The two curves indicated by dotted lines mark the most dependent drainage point when the patient lies down.

a diameter less than that of the larynx) fixing the same in position by one silk suture (Fig. 270) passing around the rib.

There is no difficulty at all about making an *air-tight joint*, provided the original puncture wound in the thickened pleura be not made too large. After the tube is introduced, the surrounding soft parts are tightly sutured up to it and an iodoform gauze dressing applied, to be changed in about a week. A better and more recent plan is to introduce a rubber tube through a cannula (Figs. 271-276).

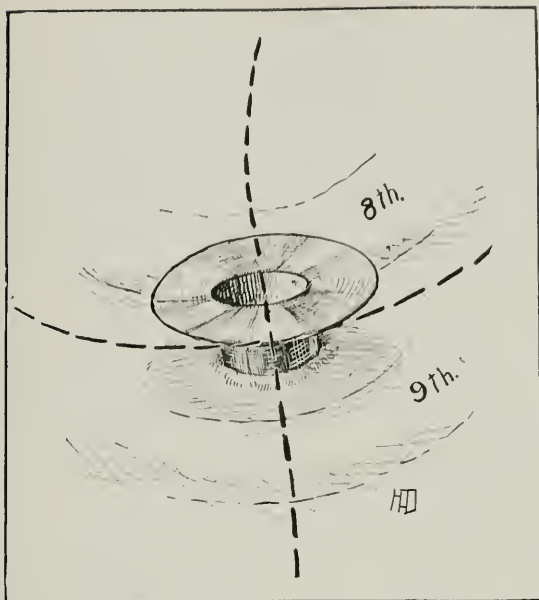


Fig. 273.—The cannula has been introduced at the intersection of curves and trochar withdrawn.

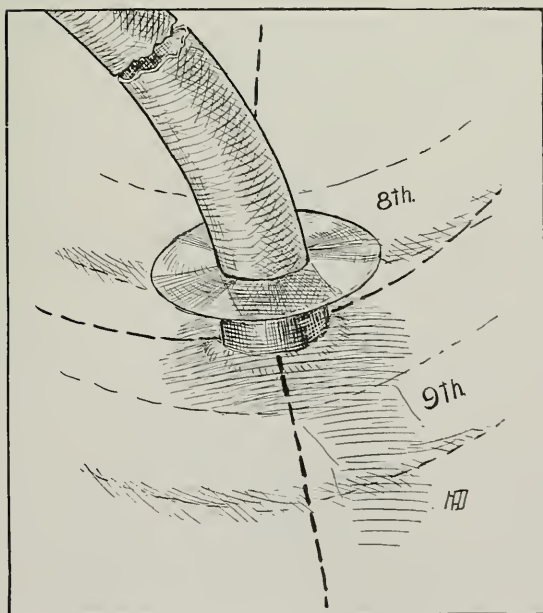


Fig. 274.—Rubber tube has been inserted through cannula.

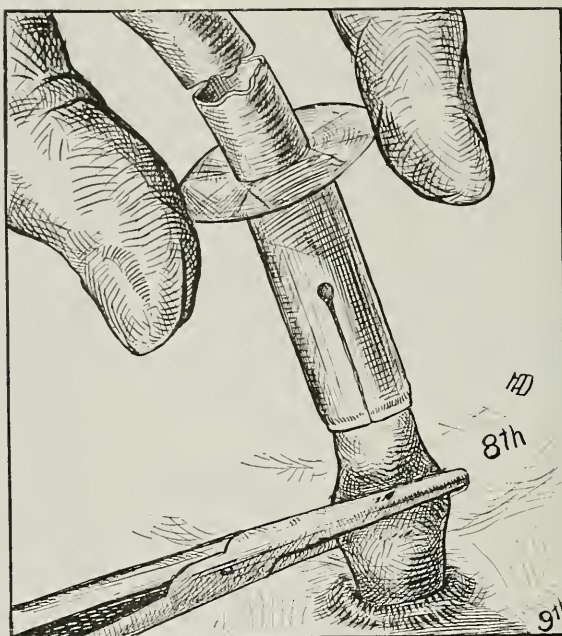


Fig. 275.—Tube held in place and cannula withdrawn.

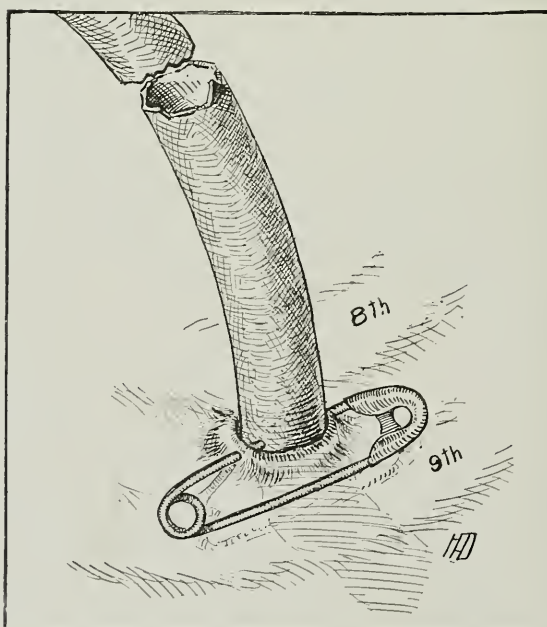


Fig. 276.—Tube held in place by safety pin passed through the skin.

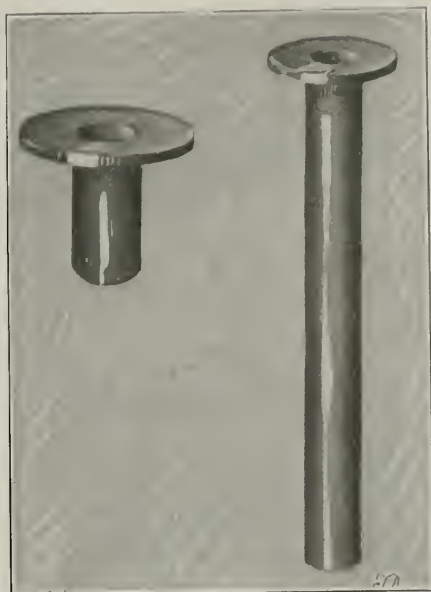


Fig. 277.—Brewer's empyema drainage tube. (Keen's Surgery.)

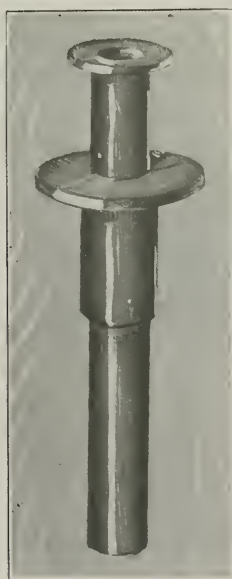


Fig. 278.—Brewer's empyema drainage tube. (Keen's Surgery.)

This method (Figs. 277 and 278) of operating obviates the possibility of *sudden death* where the rapid discharge of an immense left-sided collection allows a displaced heart to suddenly resume its normal position with consequent disturbance of the circulation in the large blood vessels.

The after-treatment, so far as this local phase is concerned, is a matter of maintaining *differential pressure* within the affected chest; that is, the atmospheric pressure within the air passages must be kept above the normal and that within the thoracic cavity must be continually diminished. The former is most readily accomplished



Fig. 279.—A convenient form of resistance against which the patient may blow.

by inducing the patient to blow against a resistance (Fig. 279). Now there is no charm for the patient in the time-honored practice of inflating rubber rings and cushions, but we have managed to arouse no little enthusiasm on his part by inducing him to practice with a mercury manometer (Fig. 280). His interest will never flag as long as he knows that he is able on each succeeding day to attain a higher level than on the one just gone, especially when he realizes that the figure registered on the scale is a fairly reliable index of the degree of improvement he is making. I have yet to see the child who can not be made to blow into a toy horn, whistle or other so-called musical instrument, and provided he is not

too sick, his interest can be kept up indefinitely if he acquires a new instrument every day. These few suggestions can be multiplied *ad infinitum*, and constitute the valuable part of the surgeon's armamentarium so far as this field is concerned.

Negative pressure within the diseased pleural cavity can be most readily induced by scrupulous attention to the long tube which has

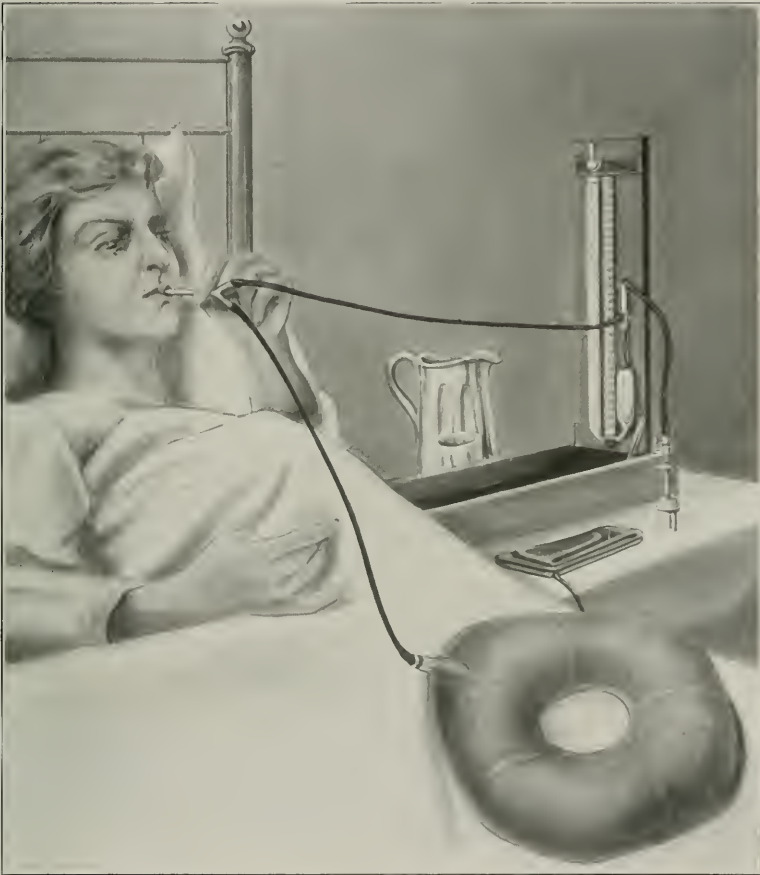


Fig. 280.—The blood pressure apparatus and rubber ring transformed into a resistance apparatus.

been introduced through the thoracic wall. It must reach to the floor no matter whether the patient is in bed or sitting up, and must under no circumstances ever have its lower end opened. It is kept constantly submerged in a bottle (Fig. 281) of some mild antiseptic fluid, and being full of pus, sufficient siphonage is induced to exhaust the air in the cavity and to encourage expansion

of the lung to the physiologic limit, provided, of course, that the tube has an air-tight fit in the chest wall. The lower end of the tube must be clamped (Fig. 282) whenever it becomes necessary to empty the bottle or other container in which it is kept immersed.

Such a tube will very rarely become plugged. I have had on one or two occasions to introduce a flexible metal sound into the chest in order to keep it open. This, however, will very rarely become necessary. Respiration under abnormal conditions is always facilitated by the *erect posture*, hence it goes without saying that these

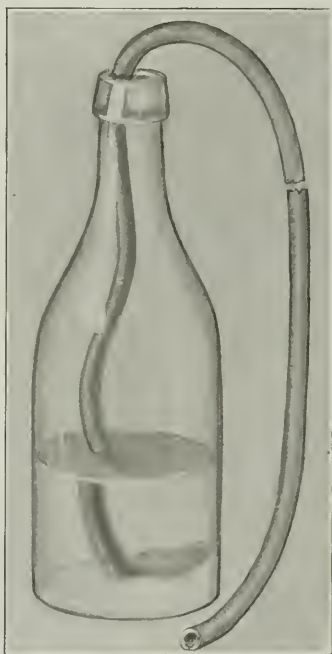


Fig. 281.—Showing bottle and lower end of drainage tube covered by an antiseptic solution.

patients should be allowed to sit up (Fig. 283) at the earliest moment which is compatible with the general condition.

The same considerations which would guide one in other fields of surgery are to be taken into consideration here. It is merely to be insisted upon that the bottle containing the lower end of the tube should accompany the patient from the bed to the chair and, indeed, siphonage is accelerated as soon as the chest reaches the highest level which is attainable.

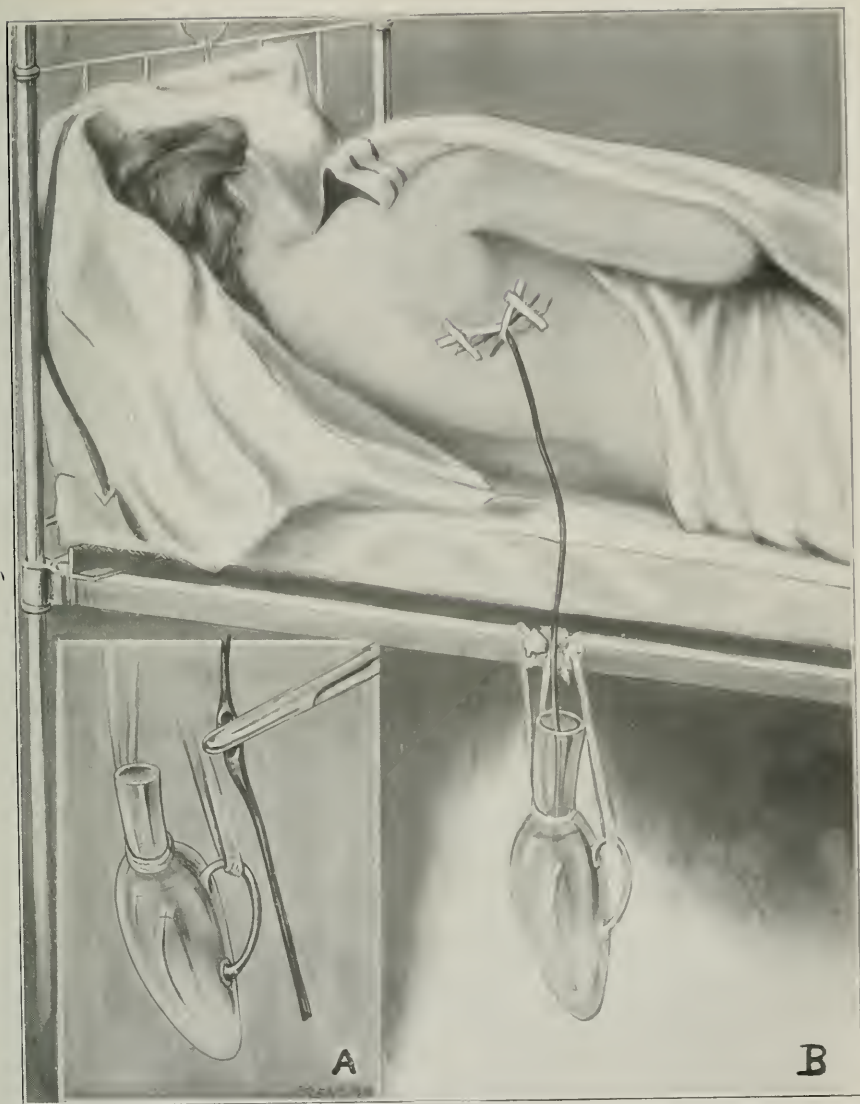


Fig. 282.—*A.* Shows clamping of tube while bottle is being emptied. *B.* Drainage apparatus in place.

The proper date for *removing the tube* must be suited to the individual requirements of the case. My own custom has been to take it out when upon forced expiration the patient can expel neither pus nor air through the tube. This can be most readily ascertained by observation of the clear fluid in the bottle during the time the patient is making the expiratory effort. By the time this

has taken place the two pleural layers will have become everywhere firmly adherent, so that there is no danger of intruding air re-establishing an actual cavity immediately after the tube is out.



Fig. 283.—Patient sitting up with drainage apparatus in place.

Too much emphasis can not be laid upon the *general* treatment of one of these patients. If the operation has not been done promptly one often sees them in a deplorable condition, hence forced feeding and elimination, fresh air, sunlight, amusements, and sleep, as so frequently mentioned elsewhere in this volume, are most urgently demanded here.

Chronic Pneumothorax.—A consideration of chronic pneumothorax must unfortunately form a part of the after-treatment in empyema since not every such patient is so fortunate as to be properly treated.

The far-reaching effects of this malady have an exceedingly simple pathologic basis which can be traced back to the anatomic consideration that the chest wall is normally rigid, and to the physiologic fact that the elastic tissue in the lung causes it to collapse when the atmospheric pressure within the thoracic cavity equals that within the air passages, a matter to which attention is called in the foregoing chapter. Nature then, makes an ineffectual attempt to obliterate the enormous pleural cavities in the usual way; that is, by *thickening* of its lining; namely, the *pleura*. Granulation tissue forms first, then connective tissue is formed, and in the course of time, incredible as it may seem, the pleura attains the thickness of a few centimeters without, of course, totally obliterating the cavity unless it be originally only a moderately large one.

Ribs on the affected side are drawn nearer together with a consequent *scoliosis* which under certain circumstances embarrasses the circulation by compromising the room at the disposal of the heart and greater blood vessels. As a matter of course the respiration is embarrassed because the lung on the affected side is thrown out of function on account of positive pressure within the pleural cavity to say nothing of the thickened pleura which later binds it down. There is an excessive loss of body fluid from the extensive granulating surfaces, a matter which tends to gradual exhaustion of the patient.

Amyloid changes ultimately take place in the spleen, liver, kidneys, and intestines just as they do after chronic suppurating processes elsewhere in the body. The symptomatic appearance of the patient reflects the gravity of these anatomic and physiologic deteriorations. A detailed description will be superfluous for the observer who has had clinical opportunities in this direction.

Postoperative treatment of this condition becomes at once surgical, since no other offers the slightest hope for improvement and the execution of it presupposes a knowledge of the two basic physical factors (in a slightly altered form) which have been mentioned above.

The large long-standing *cavity* must be *obliterated* unless the exhausting suppurative process is to continue; a thing which can be accomplished in only two ways. First, by so mobilizing the chest wall that it can meet the lung or else by removing the thickened

pleura which prevents the expansion of the lung or by a combination of these two procedures.

In 1890 Schaede published the first rational method for accomplishing this much desired result. He removed all of the ribs and thick pleura from a large flap made out of the upper lateral *thorax wall* with a result that the remaining muscles and skin were able to *collapse* down onto the shrunken lung and thus disposed of the dead space. The results of this procedure in hundreds of authenticated instances have left nothing to be desired. One can not in a work of this kind give all of the exact details of the operation especially since Schaede's own words are quoted in the large handbook on "Practical Surgery," by Bergmann, Bruns, and

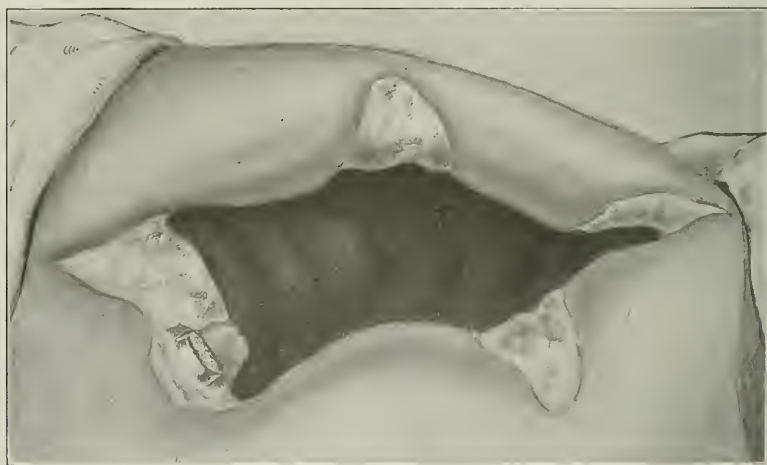


Fig. 284.—Trap door made in chest wall by removing segments of four ribs.

Mikulicz, of which an easily available translation into English exists. One must state in passing, that Estlander one year before Schaede published a somewhat analogous procedure, but since it is not nearly so valuable, no extensive mention is made of it. Beck removed a segment of chest, allowing skin to line the cavity (Fig. 284).

The most unyielding portion of the chest wall is, as a matter of course, the upper portion, hence it comes about that the scapula is involved in the making of any large flap and in consequence the *functions* of the *shoulder* and arm are somewhat interfered with. This, however, is never a matter of great moment, and frequently of tem-

porary character only, hence is not to be weighed in comparison with the vital relief given by the operation.

The *spinal column* begins to straighten out much to the patient's gratification very early after the removal of thickened parietal pleura and ribs which had been drawn too closely together during the shrinkage process.

The function of the collapsed lung, much to the surprise of early observers, reasserted itself as soon as the dead space was disposed of and the wounds healed.

General considerations of *physical rebuilding* constitute the most important part of the after-treatment here, since little of a local nature can be done aside from repacking the dead space loosely with gauze after the original pack put in at the operation is removed. The ordinary considerations which govern an infected wound are here to be followed (this has been fully considered under wound treatment in an earlier chapter).

Dèlorme (Gaz. d. hôp., 1894, No. 11 and 1896, No. 148) proposed that operative treatment of this condition consist of the liberation of the collapsed and imprisoned *lung* by dividing or removing the thickened visceral pleura. From many French sources comes enthusiastic praise of this procedure, while the Germans are equally moved in favor of the plastic procedure above detailed.

It is probably impossible to say that either of these procedures is the better in general; no doubt, there are special indications for one or the other in given cases. The surgeons making a special study of this field, so far as is known, seem to feel that the average case is best served by a *combination* of the two methods which falls somewhere between the two extremes.

Of course, the *Dèlorme* operation makes the more ready appeal to the imagination, since it is a *constructive* while the *Schaefer* is in a sense a destructive procedure. The fact that we have no means of knowing just which lung has retained the possibility of expansion after the removal of the visceral pleura constitutes the only practical bar to the universal acceptance of the ingenious French idea.

CHAPTER LXVI

SURGERY OF THE ABDOMEN

By Willard Bartlett, St. Louis, Mo.

After-treatment in the field of abdominal surgery merits special and extended attention, since most of the operations performed nowadays have to do with this part of the body. This comes about in consequence of a number of factors operating singly or in combination, the abdominal viscera lack in front as well as laterally, the degree of protection afforded by nature to those of the chest and head with their rigid walls. Furthermore the contents of abdominal hollow viscera are not tolerated at all after they have escaped from certain highly specialized containers. In bulk these materials consist largely of ingested foreign bodies. There exist normally in the abdominal contents practically all of the pathologic as well as putrefactive germs to which the body is host.

The large glands of the abdomen produce with one exception excretory products which are highly irritating, as is the secretion of the pancreas when it escapes. It is not at all surprising that abdominal surgery is of common occurrence when we take into consideration the fact that the containers of the above-mentioned fluids and semisolids suffer a loss of continuity rather frequently.

Abdominal Wall.—Surgical operations and after-treatment are necessitated most frequently in the abdominal wall by two clean-cut considerations. They are:

1. Weak area in the wall itself.
2. Increased intraabdominal tension.

Congenital weak areas exist because certain cord-like structures must pass through the abdominal wall; viz., fetal structures at the umbilicus as well as the spermatic cord and round ligament in the inguinal region. Of equal importance in this connection are the *artificial openings* which are made for the purpose of attacking the viscera within.

Intraabdominal tension is increased (Figs. 285-288) whenever the individual strains for any purpose whatsoever, hence it is readily seen how a hernia may be produced by the combination of these two factors. Since hernia is treated surgically in so many instances

it comes about that after-treatment is necessitated indirectly by the considerations just outlined.

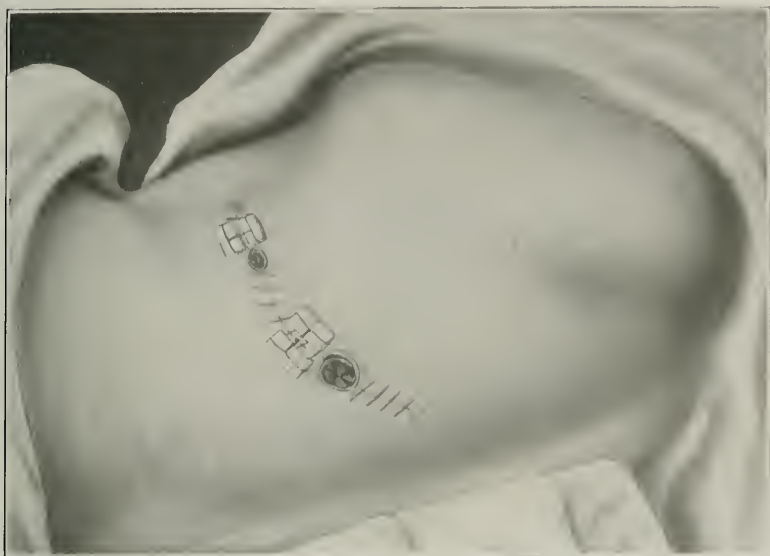


Fig. 285.—Double tension sutures tied over pads of gauze to either side of the incision.

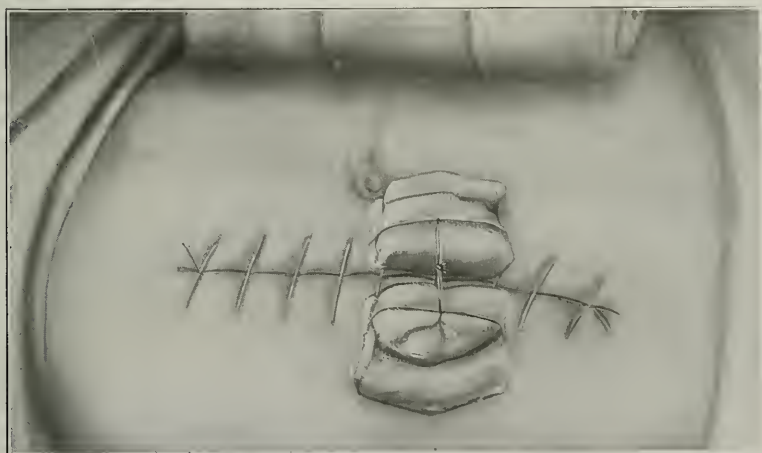


Fig. 286.—Free ends of tension sutures tied over separate pads of gauze. Free ends of thread united.

The correction of defects in the abdominal wall is a problem for the operating room, but the question of intraabdominal tension concerns after-treatment later and is one of utmost importance, no



Fig. 287.—Tension sutures reinforcing mattress skin sutures.

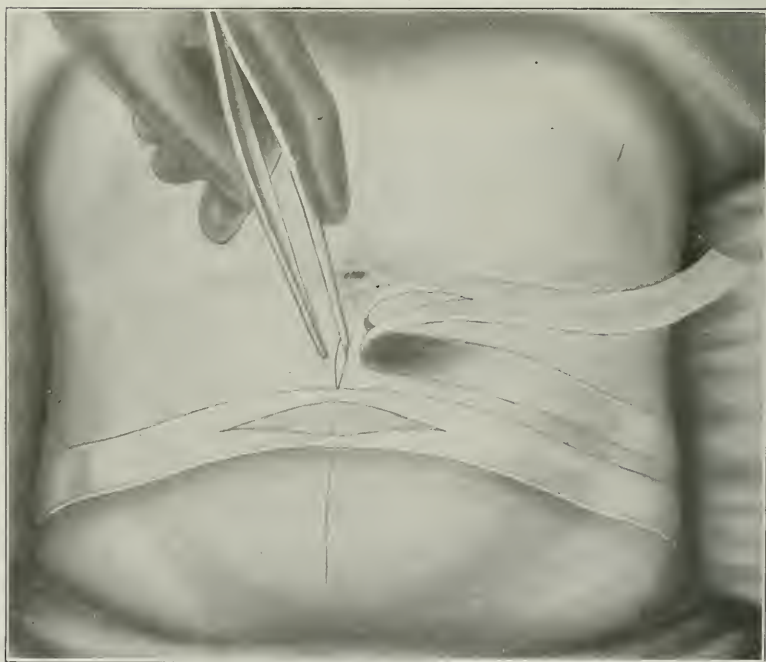


Fig. 288.—Tension strips of adhesive buttonholed to allow escape of discharge.

matter what the variety of hernia, if a recurrence is to be obviated.

It is a general principle of nature to successfully meet physical requirements by process of hypertrophy, hence, all our experience leads us to the very logical conclusions that *cultivation of the ab-*

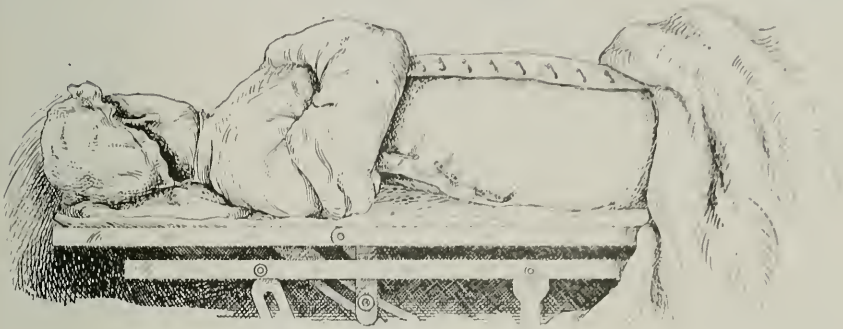


Fig. 289.—An ordinary supporting bandage for the abdomen.



Fig. 290.—The Gellhorn apparatus for applying heliotherapy to an undressed abdominal wound.

dominal muscles constitutes the most effectual means of furnishing the natural support required by the abdominal viscera.

There was a time when *artificial supports* were considered indispensable after the repair of defects in the wall. In most instances, however, this is bad practice, and now in the absence of

special indications which can not be detailed here for want of space, it is generally considered better to dispense with any form of supporting bandage (Figs. 289 and 290) very soon after the patient resumes normal muscular activity. In addition to this, the individual should be taught the various forms of gentle gymnastics which are calculated to develop the musculature of the abdominal wall.

No matter what the form of hernia, it is equally as essential after as before the operation that treatment be afforded any cause for *straining* which may exist in connection with the use of the natural bodily orifices. The most prolific sources of recurrence in this connection are straining at urination on account of prostatic enlargement, the exertions incident to coughing and sneezing where chronic respiratory difficulty exists, to say nothing of the very common exaggeration of the effort required to evacuate the bowels in those who are habitually constipated. The strain of vomiting may here be mentioned, although on account of its comparative infrequency it is not of the same importance as are the three above mentioned.

The great frequency of postoperative ventral hernia, to be discussed a little later, leads me to believe that there is a general neglect of these commonly existing and exceedingly important factors in the production of increased intraabdominal tension.

Inguinal Hernia.—We shall take up first under this title the after-treatment of patients who have been operated upon at a convenient period in the course of a *simple* inguinal hernia. Later on we shall consider the *incarcerated* and *strangulated* cases under separate headings.

It may, with a certain degree of fairness, be presupposed that the bearer of a simple inguinal hernia has been operated upon by an infiltration anesthesia method, the chief argument here being that one obviates to a large extent, the postoperative increase of intraabdominal tension due to coughing, vomiting, and constipation, which are so commonly induced by a general ether anesthesia.

The *wound dressing* in my own hands has been reduced step by step until I now apply nothing but a strip of gauze and a coat of collodion (Fig. 297*B*). There are various arguments for voluminous dressings and spica bandages, but they have all been outweighed in my experience by the fact that there seems to be no adequate protection against soiling by urine in this part of the body. Furthermore, the movement of the patient's leg displaces any form of dressing here applied in a way that does not obtain in the midline. The perineal strap acts as a direct conductor toward the wound

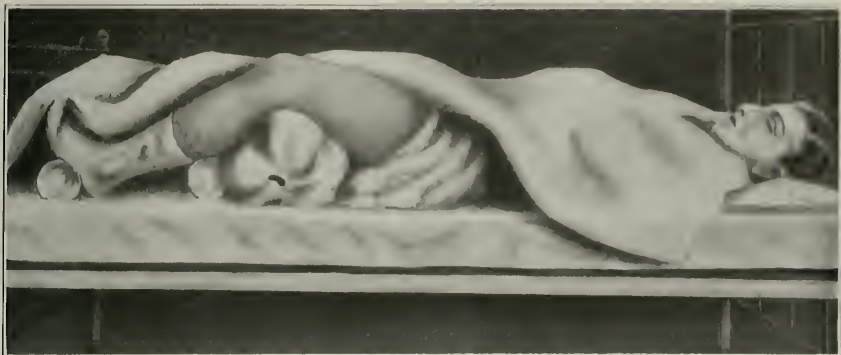


Fig. 291.—The broken position which takes tension off sutures in inguinal region.



Fig. 292.—Patient on side in broken position.



Fig. 293.—Broken position at a late period in convalescence.

for the feeces and perspiration in case the greatest care is not observed, hence it has seemed better to employ no large dressing at all than one with which so many possibilities for accident exists.

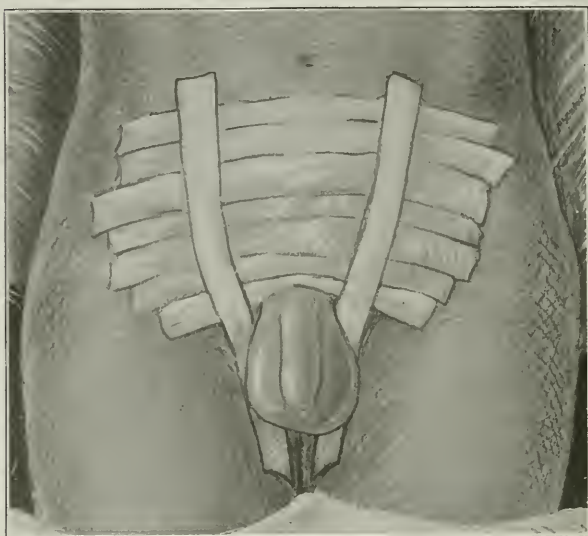


Fig. 294.—A convenient dressing for those who insist on using one, in inguinal hernia.

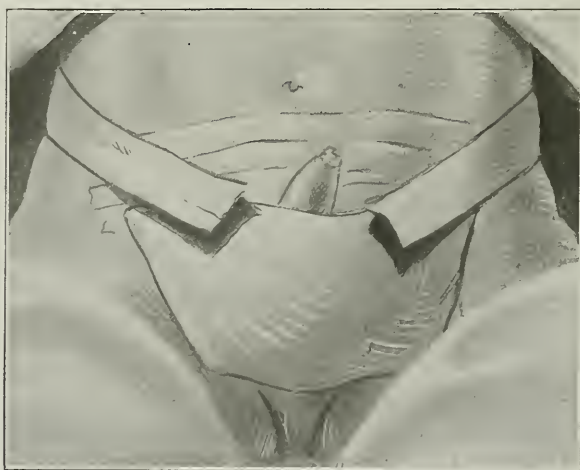


Fig. 295.—A pad of gauze supports the scrotum and contents.

It is well to employ in bed what is termed the “*broken position*.” This phrase indicates a position in which the shoulders and knees (Figs. 291-293) are kept elevated in order to minimize the strain

on the suture line. The patient is thus rendered comfortable and a firm union is, no doubt, favored.

For relief of the symptoms likely to present themselves during the first few hours after any operation under local anesthesia, the reader is referred to the chapter on Earliest Subjective Manifestations.

It should be routine practice to maintain the scrotum and *testicles* at the *highest possible level* (Figs. 294-297) from the moment the patient is returned to his room until he leaves the hospital. No matter whether the cord is transplanted, the large veins excised, or the external inguinal opening made too small, there is so much in-



Fig. 296.—A T-binder holds the pad in place.

terference with the circulation to the testicle that complications are very likely to ensue. I have very frequently seen the testicles swell with a mild acute inflammatory manifestation to be succeeded ultimately by an atrophy of moderate degree, in cases where post-operative elevation of the organ was neglected.

In other instances the interference with venous return leads to a *hydrocele* of the ordinary variety which has proved so troublesome as ultimately to necessitate the customary operative measures for its removal.

It is my custom to acquaint every hernia patient in advance with these possibilities and inform him that he may possibly have to pay for success in the treatment of hernia by some disagreeable consequence so far as the testicle on the same side is concerned.

No doubt, one forestalls disappointment and possibly even legal complications in this way.

It is preferable to keep patients *in bed* almost two weeks after the operation for inguinal hernia. Many think this is a needless precaution, but it can surely do no harm, and it is known from a study of histology that the formation of new connective tissue on which any such operation depends for its success, is by no means complete, at this time and surely not at an earlier period.

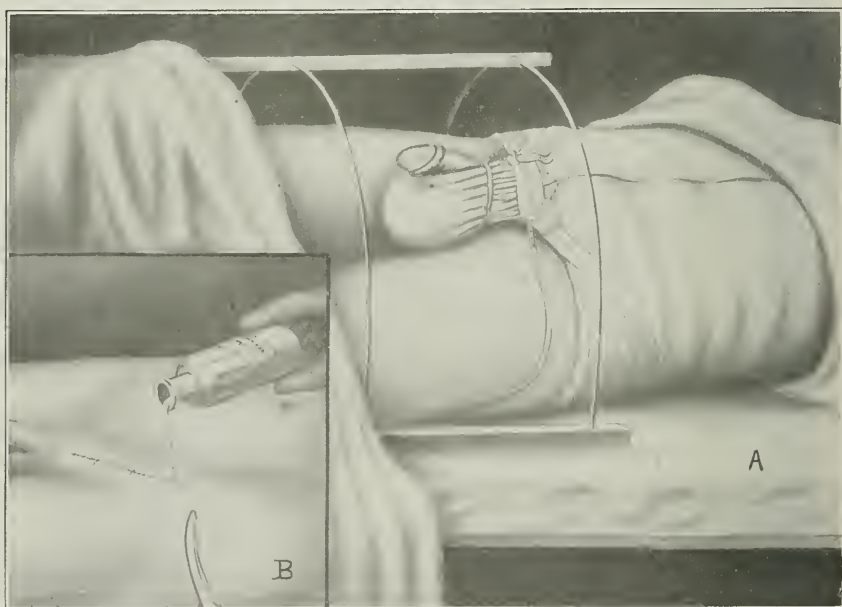


Fig. 297.—A. An ordinary commercial suspensory which is less useful than the support just shown. B. The application of collodion to an inguinal hernia wound.

A *truss* should never be worn before the appearance of a recurrence. This is self-evident when one considers that such a device acts like a wedge and may in consequence of pressure atrophy, produce a thin weak spot where none existed.

Recurrence after the modern operative methods is exceedingly uncommon. Its incidence is variously estimated by the different surgeons of large experience in this field; I believe it safer to give no figures, but to state that it practically never occurs where it can not be explained by an error in the after-treatment as far as increase in intraabdominal tension is concerned or by some blunder which the patient makes in the matter of muscular exercise, or in

the pursuit of an occupation which unduly exposes him to a like danger.

The local treatment after operations for *incarcerated* inguinal hernia differs in no wise from the foregoing; in general one will have to do with the after-effects of an intestinal obstruction which has just been relieved, and to avoid repetition, it is better to refer the reader to the general chapter on "Ileus."

If local anesthesia is ever of value in the operative treatment of hernia let us presuppose its universal application in connection with *strangulation*. The subject must be considered under two headings, the first embracing those patients in whom a *resection* of the strangulated intestine or other contained viscus has been made; it has been amply covered in the chapter on the surgery of the intestines which follows this one, or in that on simple inguinal hernia, which precedes this one. Under the second head we must give special consideration here to that other class of strangulated inguinal hernias where *replacement* of doubtful intestine has been made for the reason that the surgeon detected no solution of anatomic integrity and was led to expect complete restitution of function. Unfortunately there is no absolute guide in these cases and one may err on the side of conservatism, although it is equally bad to be unduly radical, since many of these individuals come to the operating table when they are not fit subjects for intestinal resection.

If the surgeon being unable to decide the matter, has taken the middle ground and created an immediate *fecal fistula*, our problem becomes the simple one of keeping the patient clean, nourishing him, which may be a matter of the greatest difficulty, and of later closing the fistula by operative means.

A number of possibilities arise when the strangulated loop of bowel has been *replaced* in the abdominal cavity. Unless the healthy bowel is well seen in continuity with the diseased portion replacement of the chief factor in the strangulation is possible. Suppose this to have been an unyielding tissue band or ring of any sort, one readily understands that the operation has been in vain, and unless undertaken once more in more capable hands, a fatality is inevitable.

The *wall* of the diseased bowel very early becomes *pervious* to germs, hence the fluid in the sac is highly infectious, and since it contaminates the freshly incised tissues, wound infection is not uncommon, but is to be met by the ordinary means which are detailed in the chapter on Wound Treatment.

Thrombosis of superficial as well as of mesenteric veins with consequent pulmonary and other forms of embolism is of comparatively frequent occurrence in this connection. This is merely mentioned for the sake of completeness, but can not be considered more fully here since this has been done under various appropriate headings.

Intestinal obstruction will be the leading symptom to indicate that we have replaced a nonviable or functionless intestinal coil. There are a variety of explanations for this phenomenon possible. The bowel may be paralyzed on account of having had its blood supply interrupted by the constriction or at a later period may be gangrenous from the same cause. Instead of a mechanical ileus one of a functional nature may exist as a result of the fact that the bowel is merely paralyzed in consequence of germs having passed through the wall and set up a localized peritonitis. However, if this continues long enough, it matters very little which form of ileus obtains, since without treatment the end result will be the same.

Perforation in consequence of constriction may take place very suddenly during a satisfactory convalescence at a very remote period. Koenig once reported a case in which the symptoms appeared as late as fifteen days after the operation. He explained this by stating that the original defect was produced in the mucous membrane and that it then required all this time for the traumatic ulcer to gradually make its way through the remaining coats.

A most disagreeable but at the same time a fortunate outcome for these cases is sometimes the spontaneous occurrence of a *fecal fistula* where the bowel wall necroses into an adherent area and the contents find their way to the skin surface with the immediate subsidence of obstructive symptoms. Such cases usually require later operative measures, but all this has been fully considered earlier in this book under the caption of *Fistulae*.

Umbilical Hernia.—The after-treatment in umbilical hernia differs in only a few particulars from that of hernia in general, but we consider it essential that certain fundamentals of this treatment be very definitely understood. It has to do frequently with enormous visceral masses which have, so to speak, “lost their right of habitation.”

This gives the clue to the principal element in the after-treatment; namely, the care of increased *intraabdominal tension*. It is natural to assume that no experienced operator will force back into the abdominal cavity and confine therein a larger mass of viscera than can be readily covered by a wall which will have shrunk during

the extraabdominal existence of the herniated contents. Either he will amputate and resect what can not be replaced or simply leave it in its newly formed habitation and repair the incision he has made in its containing sac.

But suppose for the sake of argument, that an error in judgment has been made, there will then be serious embarrassment of *respiration* due to the excursions of the diaphragm being mechanically limited and at the same time circulation will be interfered with not only by pressure upon the great abdominal vessels, but by communicated pressure upon the under surface of the diaphragm embarrassing the heart itself. I have seen this happen twice. In one instance the sutures gave way with instant relief of all symptoms. In the other, the patient died despite every effort toward unloading stomach, intestines, etc. In a future unfortunate complication of this kind we should, profiting by these two experiences, cut the deep stitches at once with immediate reclosure of the skin and allow prolapse of the viscera to ensue. This is unhesitatingly advised, since nothing else can be of service.

The very important consideration in the treatment of all these patients, since the lesion lies rather high in the abdominal wall, is the prevention of any *cross-strain*; a matter which influenced Dr. W. J. Mayo in proposing the now universally accepted vertical-overlapping operation. Profiting by earlier experiences of his own and others, Dr. Mayo was impressed with the fact that horizontal overlapping high on the abdominal wall compromised the movement of the lower ribs, thus interfering mechanically with ventilation of the lower lung areas and producing pneumonia which in many such instances proved fatal. A similar reason shows us the importance of no adhesive straps or tight binders which may in the same way interfere with the normal respiratory movements of the lower segments of the lateral thoracic walls.

"*A broken position*" will here, as well as in other forms of hernia, add wonderfully to the patient's comfort, and to the security of the sutures. This can be maintained just as well while the patient is on the side as on the back, and should be instituted just as soon as the individual leaves the operating room.

Recurrences after such operations are influenced by the same general considerations of increased intraabdominal tension as have been stated above in the special section on Inguinal Hernia, but there also comes into play here a special local feature which very largely influences the result; namely, the degree of overlapping which is possible.

The widest vertical overlapping which can be made gives the greatest assurance of permanent success, while on the other hand, I know of failure in a few instances where vertical edge-to-edge wound suture was the only procedure possible under the circumstances.

CHAPTER LXVII

INCISIONAL VENTRAL HERNIA

By Willard Bartlett, St. Louis, Mo.

Surprisingly little has been written upon the subject of incisional ventral hernia, when its frequency and importance are taken into consideration: indeed many of the general textbooks fail to mention it at all. It is, of course, not an *immediate* complication, but if a surgeon values after-treatment, in the wider sense, he must take the subject carefully into consideration.

It seems paradoxical, but we must admit that this form of hernia is indirectly a product of the advances in asepsis which allow frequent opening of the abdomen.

It is well to state in passing that our consideration of this subject differentiates sharply between postoperative hernia, having a well-defined ring with sac, muscle paralysis with stretching as a result of nerve section, and prolapse of abdominal viscera.

My own experience¹ in the treatment of postoperative hernia embraces a study of 91 people of whom 86 were operated for this accident. In 24 cases the *original* operation was performed by me.

Out of the 91, I know definitely of success in 61; the time between their operation and when last heard from ranging from one week to nine years, an average of eleven months. In sixteen of these cases I have been unable to learn the result. Six were complete failures; in two of them a filigree was used; the overlapping method being employed in the remaining four instances. (Ferguson² who was a master of this subject, thought the overlapping of thinned-out fibrous structures likely to give recurrence, in spite of the enthusiasm attending the use of the method.)

The following four patients died: (1) a strangulated hernia, eight hours after operation; (2) a cancer of the uterus, a few weeks later; (3) a cirrhosis of the liver after four days; (4) a second cirrhosis of the liver, died very suddenly eleven days after operation.

Etiology.—A survey of the cases studied with reference to etiologic factors, reveals that postoperative vomiting was present in 75 per cent of the cases; meteorism was present in 83 per cent, and cough in 25 per cent. Some kind of drainage was necessary in 86 per cent, while packs were employed in only 8 per cent. The op-

erative wound frankly suppurated in 75 per cent; constipation was marked in 66 per cent, and dysuria was complained of in 25 per cent. The postoperative hernia was directly traceable to muscle strain in 30 per cent, while 88 per cent of the patients gave a history of a gain in weight after the original operation. Postoperative pregnancies were noted in 8 per cent, and some form of unsuccessful herniotomy had been performed in 30 per cent of the cases studied. It is evident from these figures that the most important etiologic factors are (1) postoperative gain in weight, especially if the gain is excessive and rapid; (2) the employment of drainage, regardless of the type of drainage material used; (3) meteorism; (4) wound suppuration; (5) postoperative vomiting; and (6) constipation.

It might be noted that of these factors 1, 3, 5, and 6 have to do with a definite increase in the intraabdominal pressure, while in 2 and 4, a distinct weakening of the abdominal wall has taken place. It is quite obvious that the majority of hernias are the result of a combination of several of these factors, rather than of any particular one.

The time the patient had remained in bed following the original operation ranged from three weeks to five months, an average of seven weeks.

A binder had been worn from six weeks to two years, an average of eleven months.

The onset of hernia had varied from immediate up to four years, an average of one year after operation.

A glance at the work of other authors (involving a certain amount of repetition) impresses one with the fact that certain constant factors practically determine the occurrence of hernia after a laparotomy.

Tate³ believes that postoperative hernia is much more common in fleshy women and in multiparæ; where there is too long an incision or one that is unnecessary; where there is too much clamping, and after transverse division of muscle fibers. He also remarks that wounds do not unite well in very frail people.

V. H. Johnson⁴ gives the following factors in production of hernia following appendectomy: (1) long incision; (2) cutting off nerve supply to muscles; (3) incision made through muscle tissue; (4) closing incision with a single set of sutures in one layer; (5) packing the wound with gauze; (6) length of incisions is not more important than tissues through which they are made.

C. George Bull⁵ has observed the following causes of hernia after operation: (1) drainage (to be used only when absolutely necessary and then a small drain; after removal, stitch the ununited fascia); (2) wounds healing by granulation; (3) failure to bring fascia into proper apposition, resulting from method of suturing or tension; (4) division of nerve supply to muscles of abdominal wall; (5) vomiting and straining from any cause; (6) abdominal tension from flatus; (7) rapid accumulation of adipose tissue after operation.

Sprengel⁶ was chosen to discuss postoperative hernia as one of the principal subjects considered by the German Surgical Congress in 1914. He gave as his opinion that the following five factors were at fault: (1) tampon; (2) infection; (3) inaccurate suture and improper material; (4) postoperative injury (vomit, etc.); (5) physiologically incorrect incision.

Wolff⁷ considers gas accumulation to be in direct causal relation to postoperative hernia; hence the importance of its prevention after laparotomy.

J. H. Jacobson⁸ reports that out of 17 cases of incisional hernia, seven occurred following operations for pus appendix and 10 following median abdominal incision. In only two cases did a hernia appear where the original incision healed by primary union. It is more frequent where incision is made below the umbilicus, but very infrequent following gall bladder or stomach operations even with drainage. This is due to difference in intraabdominal pressure.

Nyatt and Buckner⁹ in 586 abdominal sections report postoperative hernias in 20 per cent of cases which were sutured *en masse*; and in only 9 per cent where separate layers were sutured. They also state that hernias followed laparotomy in 40 per cent of cases where suppuration lasted two weeks and in 50 per cent where it lasted three weeks.

Lindenstein¹⁰ examined 100 laparotomy patients three years postoperatively and found 20 hernias. None of them occurred where healing had been undisturbed by suppuration or tamponade.

Amberger,¹¹ who examined 180 cases more than a year postoperative found 20 hernias (12 per cent); 60 incisions of more than 15 cm. gave 20 per cent hernias. There were more hernias after double than triple layer suture. A binder did not protect. Primary healing is the main thing. Secondary suture is advisable (in layers).

Sabaneew had 60 to 67 per cent hernia after open treatment of appendicitis; Brun in 68 per cent; Amberger, 40 per cent; Fehling, 54 per cent, and Pichler, 65 per cent.

Secondary suture has been of little avail. Pichler¹² writes that it succeeded only four out of ten times in the Mikulicz Klinik.

I personally do not believe that pregnancy is responsible for many postoperative hernias. Pressure of a wide *uterine* surface comes on a weak spot and there is no opportunity for wedge-like action.

No one seems to have proved that a binder prevents postoperative hernia, although it doubtless limits its increase in size.

I am inclined to recommend one for the very patients who should logically acquire a hernia. This is done rather for the individual's mental than for his physical well-being, since he is sure to accept his rupture with more resignation, if he believes that every (to him) valuable prophylactic measure has been employed.

With the above statistics regarding the line of incision and infection in mind, I wrote to thirty-nine patients whose appendices I had removed in the presence of pus, through the McBurney grid-iron incision, leaving a rubber drain in place in every instance. Twenty-four of these people answered the inquiry and of this number only two have hernias, while the status of two others is indefinite.

There is a glaring contrast between these figures and the foregoing in which through-and-through, drained, infected incisions were followed by hernias with startling regularity. There is no escaping the conclusion that a physiologic incision which splits muscle fibers longitudinally and tends to close up instead of pull open has every advantage.

During the winter of 1915-1916, seniors of the Washington University Medical School operated upon twenty-three dogs in an effort to determine certain facts relative to postoperative ventral hernia: ten animals had all but one layer of the wall destroyed, no hernia resulting where we preserved or restored (a) the anterior rectus sheath, (b) the posterior rectus sheath, or (c) where the recti muscles were sutured together in the midline.

On 2 dogs defects were produced in all the layers except the skin, and on 3 the skin and peritoneum only were restored; 4 of these developed hernia and 1 dog was lost.

In an attempt to restore the integrity of the wall in the above four resultant hernias, I had the opposite sheath inverted with only partial success; 2 had both sheaths overlapped and fascia transplanted, with good results; and 1 had simply an overlapping of both anterior sheaths with cure. These dogs were under observation from 49 to 240 days.

Of 6 complete defects, 3 were repaired by immediate fascia transplants, with good results; in 2 immediate sheath transplantation was done, with a satisfactory result on 1 dog, the other being still under observation; and in 1 the opposite sheath was reflected with cure.

In these hernias and defect repairs, one, two, or, at most, three fibrous layers were depended upon to restore the wall, after finding that the original preservation of one layer prevented the occurrence of hernia.

The results of these studies enable one to state that mere damage, no matter how extensive, to the abdominal wall of the dog does not produce hernia with any degree of regularity, if merely skin and peritoneum are sutured. In fact, no bulging at all occurred in any instance in which the posterior rectus sheath alone was left intact, demonstrating conclusively that postoperative hernia depends on two general factors: (1) weak wall; (2) *tendency to hernia*, something which was not produced experimentally. Clinical experience shows the same thing to be true in the human subject, since we find hernia occurring in those who have left the hospital well, but who later are subject to increased intraabdominal tension, due to obstruction in digestive, urinary or respiratory passages, and in others who strain at lifting, etc.

Symptoms.—No surgical malady expresses itself subjectively by a wider range of symptoms than does postoperative ventral hernia. I now have in mind a man with a very large lesion high in the mid-line which, as he says, causes him no inconvenience. On the other hand a hernia, low down is quite another matter, by virtue of the viscera contained and higher hydrostatic pressure (if the term be admissible), while the patient's nervous make-up has much to do with his complaint, no matter where the hernia happens to be located.

A feeling of abdominal weakness is common, and many express the sensation of "every thing dropping down." A few of my patients have considered themselves practically incapacitated by long continuance of such suffering. A woman who was operated upon recently had remained in bed a greater part of several years and acquired the morphine habit merely to escape the indefinite dragging sensations just alluded to.

The symptomatic picture not infrequently conforms to the anatomic structure in the sac, small intestine hanging low drags on the root of the mesentery and apparently explains the backache experienced by some of these people while on their feet. In such

an intestinal displacement, we occasionally see mild derangement of every function inherent to the digestive tube. Anatomic changes in the bowel due to strangulation must be very uncommon. It has occurred but once in my experience: the patient was seen late in his obstruction and died soon after the simplest form of intestinal drainage.

It is usually contended that the large incisional ring permits bowel to escape and return with equal facility. However, the surgeon who has operated upon a large number of such patients can hardly fail to have seen numerous secondary pockets, with communications so tiny as to make him wonder at the comparative rarity of strangulation in this type of hernia.

When a portion of the bladder lies in a suprapubic sac, there are usually complaints of vesical irritability and a physical examination is likely to produce the desire to urinate.

Physical examination gives a characteristic picture. When the lesion is on one side, the umbilicus is deflected from the midline toward the sound side, while the proportions and dimensions of the protuberance are best appreciated when seen from above or in profile, with the patient in the erect posture.

If the prolapsed viscera are not in such bulk as to have lost their "right of habitation" through secondary shrinkage of the abdominal wall, they usually glide back into the cavity or can be replaced when the patient lies down, whereupon the size and other characteristics of the ring may be ascertained.

Treatment.—Any attempt at cure must consider two factors: (1) removal of hernia tendency, and (2) repair of the abdominal wall. The hernia tendency is corrected previous to operation both by reducing the patient's intraabdominal fat and intestinal contents. One short, plethoric man who came under my care exercised and dieted until he reduced his weight fifty pounds between the two operations. It was at the second sitting surprisingly easy to overlap the tissues, a thing which would have been utterly impossible at the beginning of his preoperative treatment. It is an excellent idea to put such patients to bed a few days before the operation, keep them on liquid diet, and practice liberal catharsis. This not only makes the plastic easier, but decreases the likelihood of postoperative meteorism. It is absolutely essential in this connection that a chronic cough be attended to; that any tendency to chronic vomiting or undue straining at stool be rendered improbable, and especially that obstructive conditions in the urinary passages be relieved before one considers an operation for postoperative hernia.

During the procedure, it will at times be necessary to reduce the tendency to hernia by decreasing the abdominal contents. This is a comparatively simple matter as far as the omentum is concerned, but may take us into extreme technical difficulties, as was the case a few years ago when I resected practically the entire colon which "had lost its right of habitation." This operation was entirely

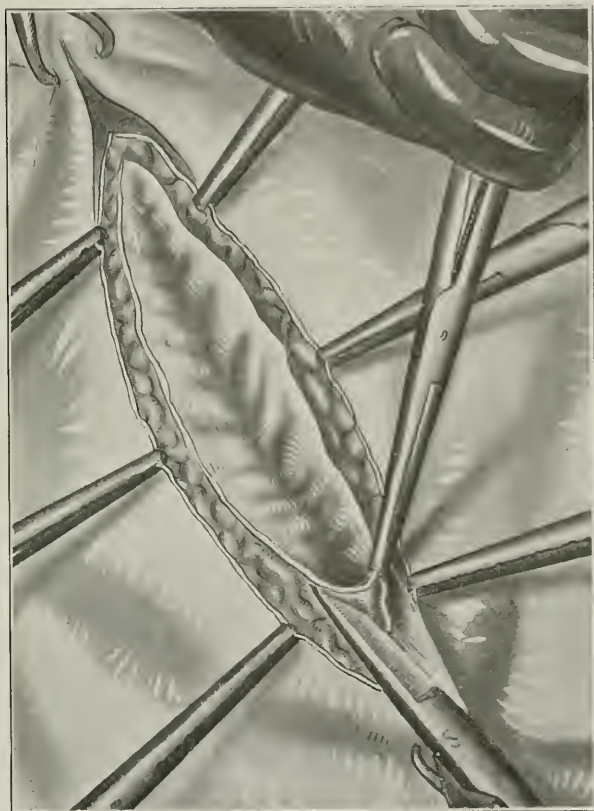


Fig. 298.—Circumcising old scar.

successful, but will, of course, be very rarely necessary. Undue tension on a reconstructed abdominal wall is bound to result in failure of the operation. Not only this, it must be added that any interference with the movements of the lower ribs is likely to result in respiratory and circulatory derangement which will end fatally.

Another interesting physiologic derangement was observed after operating upon an unusually large hernia by the overlapping method; viz., a blood pressure rise within three days from 130-80 to

170-110. It remained about the latter figures during a few days of stormy convalescence, then as the patient slowly improved, it fell to 130-80 again. No doubt the reposition of prolapsed viscera, together with circumferential shortening of the abdominal wall frequently increases intraabdominal tension, and thus indirectly causes a relatively high blood pressure of transient nature.

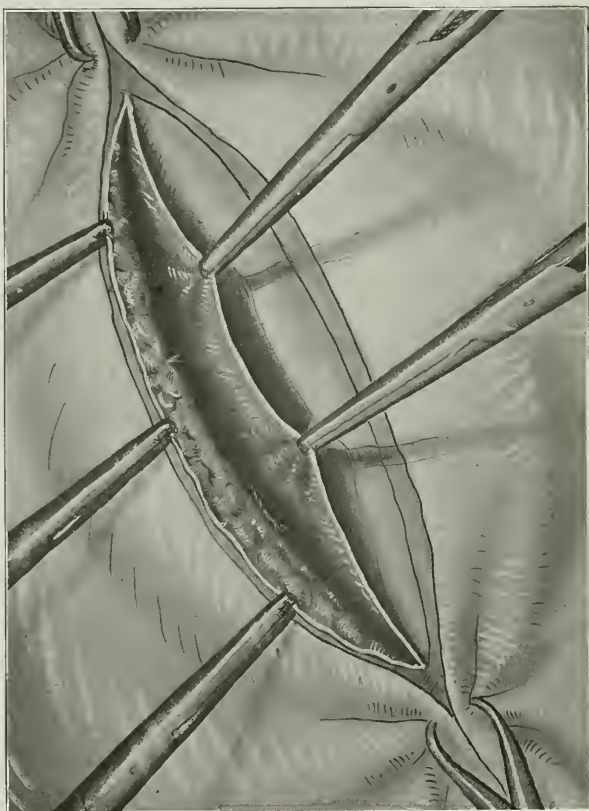


Fig. 299.—Dissecting skin scar away from sac.

The prophylactic use of infiltration local anesthesia in a few of these operations has, in my own hands, I am sure, prevented coughing, vomiting, gas formation, and urinary retention.

Having briefly disposed of the general considerations which should obtain in the treatment of this malady, it must be said before taking up the special forms of operation in detail that no one of them is generally applicable as best in all cases. A choice depends upon:

1. The site of the lesion.
2. The size of the opening and hernia.
3. The condition of the surrounding tissues.
4. The general condition of the patient.

There are five varieties of technic to be considered:

1. Overlapping is the simplest if there is enough tissue.
2. Reconstruction of the wall is anatomically ideal if there is no atrophy or destruction of the muscles.



Fig. 300.—The sac freely exposed.

3. Flap inversion is good if the hernia is in the midline above the semilunar fold of Douglas.

4. Filigree implantation is for emergency use only.

5. Free fascial transplantation is indicated if there is no other way to close the hernia.

It would lead us too far afield to review all the measures which have been employed in the operative treatment of the condition. It is sufficient to mention that a great variety of organs and tis-

sues have been utilized in plugging the opening, while I and others have devised filigrees and plates of metal to answer the same purpose.¹³⁻¹⁶

Much experience has convinced me that an operation which can be done without opening the sac has certain distinct advantages. It enables one to use to the best advantage all scar tissue and sac wall that may be present. The technical difficulties are greatly minimized if no omental and visceral adhesions are taken care of,

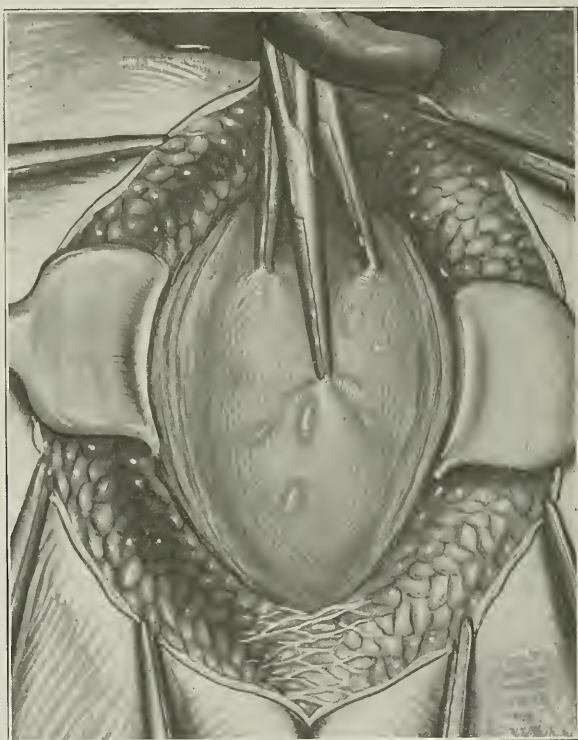


Fig. 301.—The sac pushed in, demonstrating ring.

to say nothing of peritoneal closure. But the chief gain in not opening the peritoneum is seen in the greatly decreased likelihood of recurrence due to distention, vomiting, coughing and unrest; all of them expressions of the functional intestinal disturbance which all have seen follow extensive handling of these viscera. (Of course, it will be necessary in exceptional instances to open the peritoneal cavity for a pathologic condition which is entirely independent of the hernia.)

Karewski¹⁷ retracts skin and fat from the aponeurosis and muscle, then makes an oval incision around the neck and 1 cm. from it. The unopened sac is pushed into the abdomen and the median edges of the fascial wound sewed together. If possible, the exposed muscles are sutured together, otherwise a filigree is formed of wire



Fig. 302.—The sac inverted, edges of ring being sutured together over it.

or silk and built up between the distal margins. He has operated upon thirteen people in this way, (six median and seven lateral hernias). One died of nephritis; the others were cured from nine months to four years.

Schültze¹⁸ has used the Karewski operation and most successfully. The peritoneum was not opened, but an oval incision around the ring and through anterior rectus sheath made.

Lindqvist¹⁹ uses the Maydl-Lennander operation, which is the same as the Karewski, except for "relaxing" incisions parallel to the axis of suture line through rectus sheath.

But may we not go further than is done in a simple plastic of this kind and by free transplantation lend additional strength to the affected locality. Now for the possibilities in this direction. There



Fig. 303.—Redundant sac being removed previous to overlapping of resistant tissues.

are unauthentic reports of free tissue transplantation out of the seventeen hundreds, but the first operation of the kind which is above suspicion was done by v. Bunger, when he reconstructed a nose from skin of the thigh. It is natural to suppose that every tissue possibility has been utilized in the effort to cover defects of the abdominal wall, though distinctly the most successful is that of

Kirschner,²⁰ who is the father of free fascial transplantation. He prefers fascia lata because: (1) it is easy to get; (2) there is an inexhaustible supply; (3) it is strong and inelastic; (4) it shows marked tendency to heal in, and (5) it is easy to adapt to any shape. With the appearance of this idea the surgery of abdominal wall defects may be said to have taken on an entirely new aspect.



Fig. 304.—First step of overlapping one free edge sutured underneath opposite segment of wall.

In the most exhaustive review of fascial transplantation which has appeared to date, Kleinschmidt²¹ states that fascia retains its characteristics when transplanted only when it has a function to fulfill. He considers it our most ideal material for repairing of postoperative hernia if layers of wall can not be united.

Mann²² writes the richer its blood supply, the harder a tissue is to transplant with success; hence fascia is ideal because lymph percolation insures its life. For a median hernia he overlapped

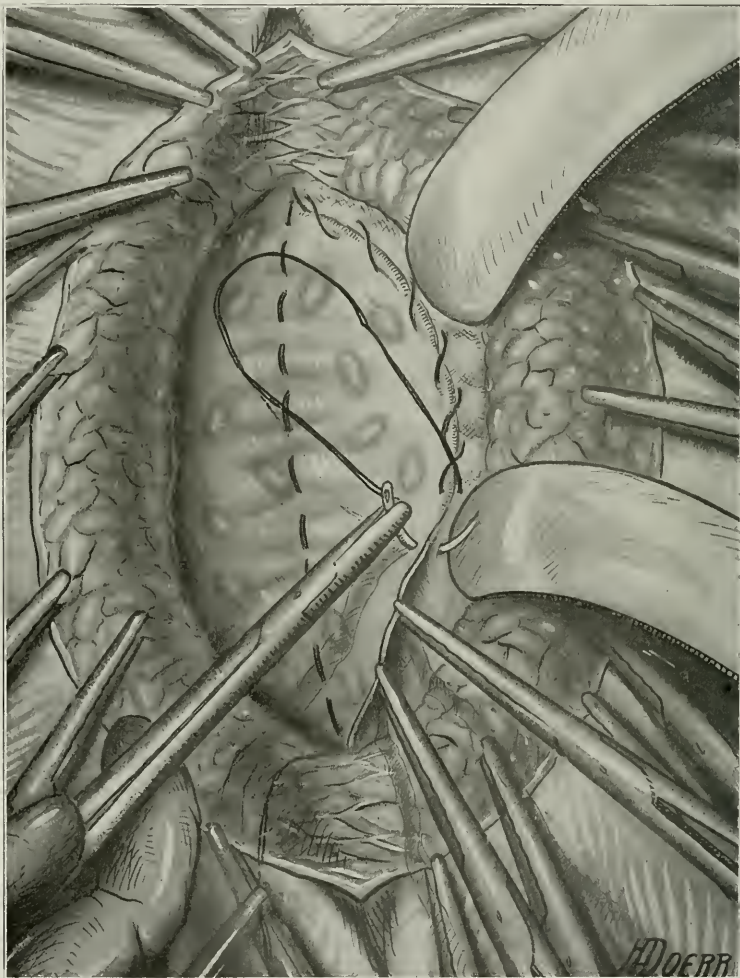


Fig. 305.—Second step of overlapping. Resulting second flap sutured in place.

the two anterior rectus sheaths and at a secondary operation filled this defect with fascia lata with complete success.

Ritterhaus²³ reports a case in which a flap of fascia lata was sewed into an abdominal wall defect of large size. This had resulted from several laparotomies and was complicated by a fecal

fistula. Still the flap healed into its new bed, and at the end of six weeks the wall was perfectly solid.

Wahrsehauer²⁴ reports ten transplantations of fascia lata in the treatment of defects of the abdominal wall. The results were most satisfactory.

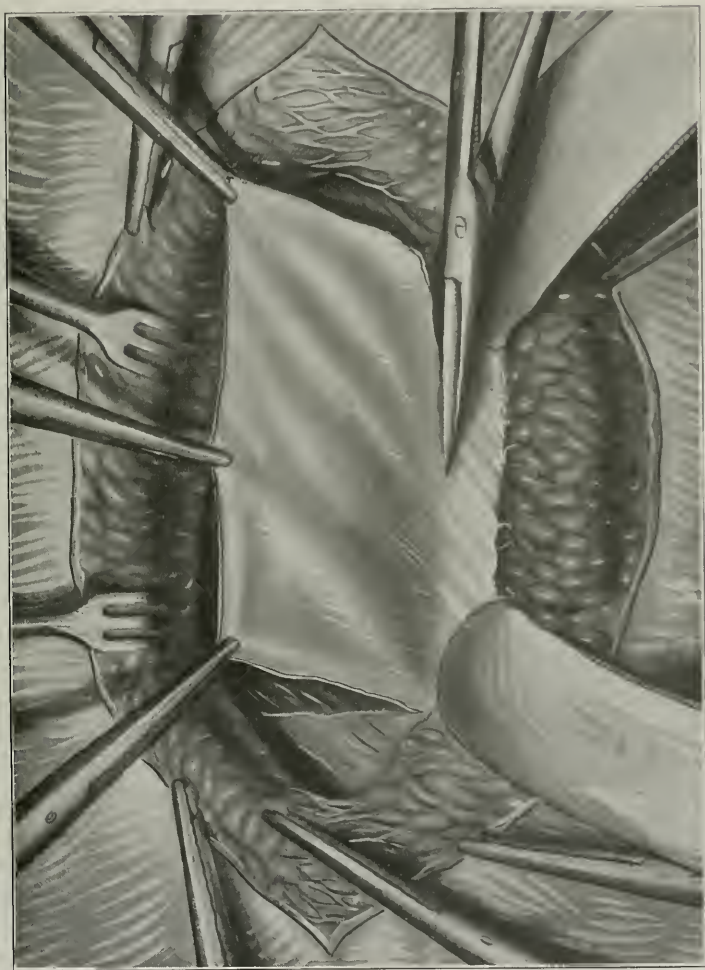


Fig. 306.—Excising fascia lata flap.

Kirschner²⁵ details the first cases in which he did his free fascia transplantation on the human subject. Among them are a number of abdominal wall repairs with single and double graft, with success in clean and infected cases.

Goldman²⁶ repaired with fascia lata one defect occurring after acute purulent appendicitis.

Seboletff²⁷ covered with fascia lata an abdominal wall defect 8×5 cm. No hernia followed in spite of coughing. The patient died after two and one-half months. The fascia was found unchanged microscopically.

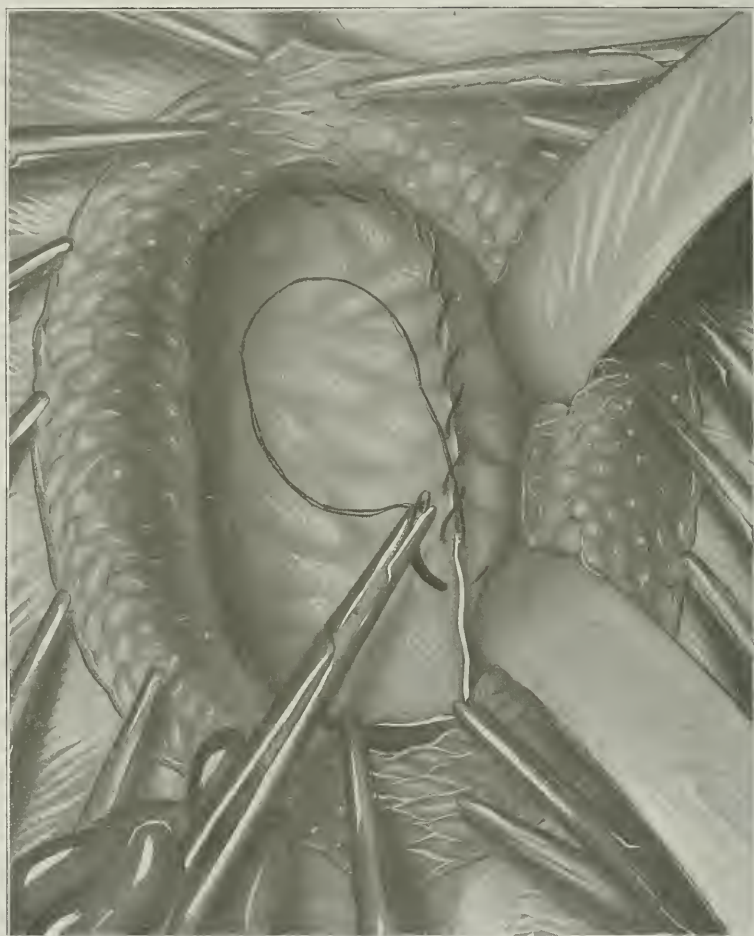


Fig. 307.—Suturing fascia lata flap in place.

Enderlin²⁸ demonstrated a patient before the Wurzburg “Aerzte-abend” whose abdominal hernia had been repaired by fascial transplantation.

Riese²⁹ relates a case of abdominal hernia following suppuration which he cured by transplantation of fascia lata.

Schmid³⁰ reports three gynecologic cases in which fascia lata was used to fill up defects of the wall, which could not be obliterated by approximating their borders.

A further proof of the value of tissues similar to fascia lata in this connection is stated by Cushing,³¹ who has had no fungus

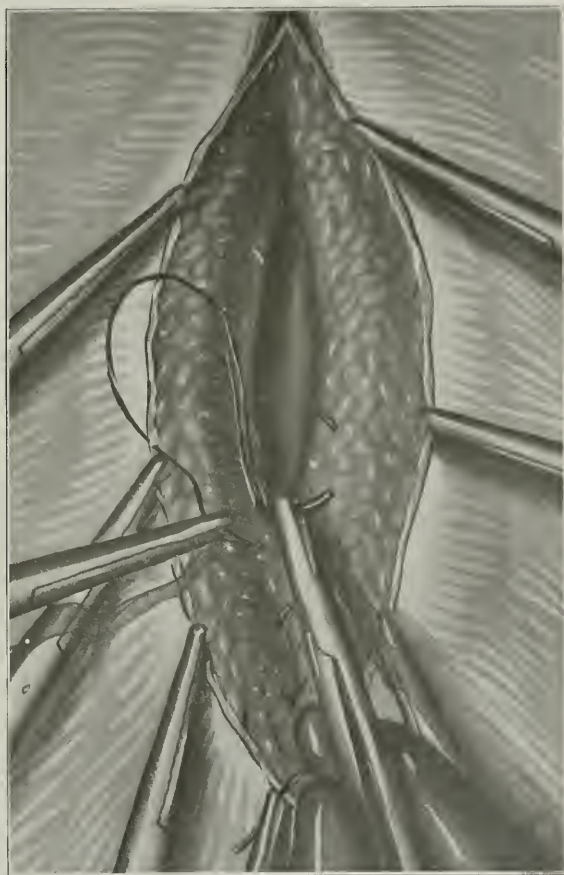


Fig. 308.—Closing dead space in subcutaneous fat.

cerebri after tumor operations. due, he thinks to closure of galea with interrupted silk sutures.

Kornev³² gives an extensive report of experimental and clinical work of various kinds done in fascial transplantation. He concludes that defects of the abdominal wall can be safely so treated.

In the absence of equally convincing evidence in support of other plastic methods, one must concede the highest value to free fascial

transplantation for the abdominal wall defects involving so much tissue loss as to render layer reconstruction impossible.

Animal³³ experimentation leads us toward the conviction that an excellent operative treatment of large ventral hernias (where

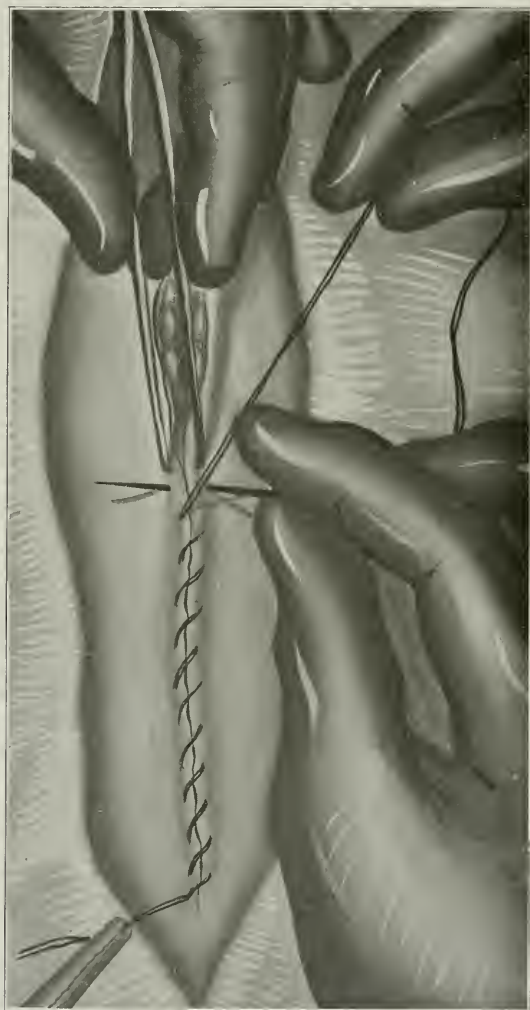


Fig. 309.—Suture of skin.

the peritoneum is not to be opened) is: liberal freeing of the neck of the sac from skin and fat; inversion of the unopened sac; with suture of its ring (Figs. 298-302) and free transplantation of a flap of fascia lata large enough to fill in the defect produced by the oval or circular incision around the neck of the sac.

Overlapping (Figs. 303-305) of all tissues encountered is too well known to require more than passing mention here. No doubt it fulfils all the therapeutic requirements of many cases, but it is far from infallible as evidenced by my own failures (mentioned above), and those of others that are known to us.

In a number of most formidable recent cases, I have overlapped as usual and then reinforced the entire exposed surface with as large a flap of fascia lata (Figs. 306-309) as could be obtained. This procedure has been productive of perfect results thus far, and is most warmly recommended as the method of choice in difficult cases.

The after-treatment will concern itself chiefly with coughing, vomiting, defecation, passage of gas and urination, to say nothing of muscular violence; in fact, every form of insult to the wound and the sutures. Of course, the convalescent patient is to be warned against occupation or recreation which unduly raises intraabdominal tension.

When hernia patients leave the hospital, Dr. Stuart McGuire hands them the following set of rules:

Your wound requires no further attention. You do not need a truss or abdominal belt. For a while you should be prudent, but in time your ruptured side will be stronger than your good side.

You may safely begin to exercise at once. Start with a short walk, the distance of two or three city blocks, and increase gradually as you gain strength.

Going up or down stairs slowly and carefully will do you no harm provided you are strong enough to do so without undue fatigue.

At first you should be cautious even in such matters as straining at stool and other physiologic acts. Be careful how you get in and out of the bath tub. Avoid jolting and driving over a rough road. Neither baths nor comfortable riding, however, are objectionable.

For three to six months be careful about getting on and off cars, lifting heavy weights, cranking automobiles, swimming, horseback riding, athletic sports, and heavy manual work.

So far as possible, keep the bowels open by natural means, such as a full generous diet, an abundance of drinking water, a moderate amount of exercise, and the establishment of a regular hour for going to stool. Mild laxatives may be necessary at times.

Put on weight if below normal by free diet, fresh air, and plenty of sleep.

At the end of a month or six weeks, you may safely begin any light work.

This is simply a guide and intended to be suggestive. You can apply the same principles to the many things that will come up and can not be foreseen. If in doubt, consult your physician. He is fully acquainted with what has been done for you at the hospital and with all the essential facts bearing on your case.

Please report your condition by mail at the end of three months. If you are well, the information will help us; if you are not well, we may be able to help you.

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CHAPTER LXVIII

THE PERITONEUM

By Willard Bartlett, St. Louis, Mo.

Hydrops.—Noninflammatory collections of fluid in the peritoneal cavity are due, usually, to circulatory affections, or to new growths of the peritoneum itself. If the affection be due to a circulatory upset, the cause may be a quantitative one, owing to disturbed cardiac compensation, or one of a qualitative nature as in nephritis, malignancy in a locality remote from the abdomen, or from one of a number of other causes. The prognosis differs, of course, with the individual case. The finding of metastatic nodules, studding the peritoneum, is often the single deciding factor in cancer of the rectum, or of some other abdominal viscus. It must be very exceptional for a patient to live long after the discovery of metastatic tumors affecting this membrane.

The treatment which will follow evacuation of noninflammatory fluid in the peritoneal cavity is bound to be, in all instances, however, very much the same. One must, in the first place, give support to the overstretched abdominal wall, and thus, exercise pressure upon the large abdominal veins, in order that we may, as far as possible, aid in the restoration of the blood pressure balance. It is also necessary to prevent, as far as lies within our power, the reaccumulation of fluid, and this is to be accomplished by the well-known means of stimulating functions of the bowels, kidneys and skin. The drugs and other therapeutic measures employed for this purpose are too well known to merit detailed mention here.

Peritonitis.—A knowledge of the anatomy and physiology of the peritoneum must, of necessity, underlie any consideration of the postoperative treatment which is intended to prevent, limit, or to cure the inflammatory affections of this membrane. Its marvelous extent is not apparent to one who takes a superficial glance into the abdominal cavity, but merits due consideration before one may speak lightly of "general peritonitis." The extent and mobility of a large portion of this membrane has a great deal to do with infectious processes upon and over it. The anatomic divisions of the peritoneum tend to limit to its own confines an infection of any one of them. One has but to recollect how the transverse colon divides

the cavity into upper and lower halves; how the greater and lesser peritoneal cavities are clearly defined, etc.

Experiments too numerous to mention have illustrated the rapidity with which infectious processes spread along the peritoneum, unless the underlying physiologic principles, which alone can control them, are thoroughly understood. Its absorptive power constitutes one of its best defense mechanisms, while the ability under altered physiologic conditions, to furnish surprising amounts of transudate or exudate, is something which can not fail to strike even the most casual observer.

The inflammatory infections of the peritoneum may be divided into: (1) septic, and (2) tuberculous. The septic may be considered under three heads, (a) acute spreading, (b) encapsulated, and (c) chronic.

Acute septic peritonitis is so intimately bound up, as a rule, with an acute lesion of some intraabdominal organ, that it seems little less than ridiculous to consider it alone, without reference to etiologic possibilities. An acute peritonitis, due to the rupture of a gangrenous appendix, can hardly be treated with any striking degree of success, so long as the open intestine continues to pour out fresh septic material. The same may be said of a perforative peptic ulcer, a ruptured gall bladder, an open diverticulum of the sigmoid, etc. An obstructed intestine very soon becomes pervious to the bacteria normally contained within the tube, hence a rapidly increasing peritonitis may be expected as a late manifestation of obstruction, and can, of course, not be curbed unless the original cause be attended to.

For the sake of completeness, we shall mention, in addition, the affections of this membrane, incident to the metastatic transmission of influenza and other germs, also the entrance of infectious organisms from without, due to traumata of the abdominal wall. In view of what has gone before, the problem at once becomes the double one of treating the original cause, which would carry us too far afield if considered in detail, as well as of considering the limiting of the peritonitis itself.

Suppose that the original cause of the malady has been treated by operative means. Then there is left for consideration postoperative care of the peritoneum alone. The question of treating septic peritonitis cases must always remain, to a certain extent, an open one, and the problem be settled after giving due consideration to the circumstances surrounding the individual case. Some operators sew up tightly and get good results with the type of patients which

other equally accomplished operators would deem hopeless, unless adequately drained. No doubt, I have erred on the side of conservatism. For many years, however, I have always adhered to John B. Deaver's dictum of "When in doubt, drain," and am inclined to believe that this is the safer course. The type of incision must influence one somewhat in his choice. A small McBurney wound will almost invariably give a perfectly tight, resistant, elastic abdominal wall, even though a large tube or mass of rubber dam has lain in the wound for several days; on the other hand, a wound which can, as a matter of course, not regard anatomic or physiologic relations as far as the abdominal wall is concerned, heals up with a very weak scar, especially if drainage material has kept its edges apart for any length of time.

I wrote to thirty-eight of my patients on whom I had operated for septic peritonitis, following perforated appendices, and found that in only two cases had there been the slightest bulging or weakness of a McBurney incision scar, which had been thoroughly drained and not sutured at all.

As to the kind of *drainage material* that should be used, we believe that all are in accord on one point, at least: viz., that gauze should never be employed under any circumstances, except to check hemorrhage by pressure, since it does not drain, but on the other hand, certainly dams back the excretions. I personally, have not used glass tubes in the abdomen, since being horrified on visiting a patient one morning, to find this drainage medium splintered within the abdomen. The unfortunate consequences attending such an accident can be readily comprehended. I furthermore wish emphatically to decry the use of metal, hard rubber, or other firm tubular structures, in view of the fact that I once saw, in the practice of a colleague at the City Hospital, pressure erosion of the common ileac artery, which was attended by an almost fatal hemorrhage, after the use of such material. Pressure decubitus of the bowel is too well known, where such agents are employed, to necessitate more extensive mention here. For blood, thick pus, etc., the temporary use of split, soft rubber tubing is recommended. It is not good practice to leave this in position for more than twenty-four hours, since, at the expiration of that time, plastic adhesions are formed about any such foreign body, and one is then draining a tract about the size of the tube, but by no means influencing any wider reach of the peritoneal cavity. Again, an advantage of removing a tube at an early date, in addition to that just referred

to, is protection of the blood vessels and hollow viscera against damage from pressure.

The value of a soft rubber tube is greatly enhanced by splitting it for its entire length. I first heard that most versatile and excellent surgeon, Charles Mayo, call attention to this simple matter.

Splitting a tube enables it to take up fluid at any point of its course, while its removal is very much simpler than was formerly the case with fenestrated tubes, into the openings of which granulation tissue grew. Under ordinary circumstances, small rolls of rubber dam, or sometimes gutta serena tissue may be employed for draining the peritoneal cavity. By reason of their consistence, the danger of decubitus is not great. They do not hold the lips of the wound far apart, are most easily anchored in position with a stitch, are prevented from slipping into the abdomen by the use of a safety pin, and the removal is attended by the minimum discomfort for the patient.

It does not make much difference whether a man uses a rubber tube or a soft rubber drain, so long as the excretions get out and the drainage material is not left in place too long. Innumerable experiments have proved as above mentioned that the peritoneal cavity can not be drained for more than a few hours at best, in view of the fact that it is so rapidly sealed up automatically.

The position of the patient is one of some import. Immediately after operation, place the individual in bed in such a manner that the drain opening forms the most dependent region of his body. If the drain opening be in front, place him to bed on his face. This is mentioned in detail, because it has excited so much comment among those who have seen it for the first time. It was Professor Kiister of Marbourg, who first called my attention to the feasibility, not to mention the value, of this procedure. Not since beginning to use it, have I employed the so-called semierect position on one single occasion. Yates of Milwaukee has shown us what we should have always known, that it imposes a very distinct load on the circulatory system, where maintained for any length of time in debilitated individuals. Furthermore, how illogical it seems, even if it were possible, to drain abdominal contents downhill into a pelvic sewer, and then drain, siphon or pump it up hill again, when we can so effectively evacuate it by rolling the patient over and allowing the toxic substances to merely run down hill out of the belly.

I have referred in a previous paragraph to the risk of leaving a hard tube in the peritoneal cavity for too long a time. I can not

finish this subject of drainage without one further reference to this phase of it. One of the commonest questions heard in the operating room is, "How long are you going to leave the drain in position?" We have heard an able surgeon answer it by saying, "The patient alone can tell." This was merely another way of saying that he would remove the drain as soon as its function had ceased; in other words, every case must be a law unto itself. No operator can state at the time of operation, just how long a given wound is going to drain profusely, but it is a very safe assumption that the drain is to come out as soon as the excretion decreases in amount.

It is a matter of primary importance that we *prevent the spread* of peritonitis, which has been found to exist at the time of operation. This can generally be accomplished by limiting or inhibiting peristalsis in the gastroenteric tract. There are two ways of doing this, the first by a purely physiologic consideration, since the contents of the canal stimulate muscular activity. We begin by relieving the stomach through lavage of any material which may have been swallowed, secreted or regurgitated into it; then allow the patient to swallow nothing at all, not even water, and of course, no cathartic of any kind; no enemas must be used, nor even a rectal tube inserted, since any foreign substance in the rectum produces activity of the lower bowel. A strict observance of the measures just outlined, is generally very efficacious. I have, however, for many years obtained strikingly good results by going still further and employing opium or one of its derivatives, to the physiologic limit. Without venturing to dictate the dose of morphine, which can be tolerated in the given case, I will say that on the average we employ $\frac{1}{4}$ gr. every three hours until acute symptoms have subsided. I think it best in many instances to slow the respiration down to sixteen, or even sometimes to twelve in a minute, before feeling that the physiologic limit is reached. Of course, the dose must be altered in the extremes of age to suit the prevailing conditions. The hypodermic of morphine is used as a routine where the patient does not seriously object, or think that he may have an idiosyncrasy to the drug. Under such conditions, the insertion of opium suppositories will be found equally efficacious, and decidedly more agreeable. Suppositories of one, two or three grains, according to circumstances, are employed if hypodermics seem contraindicated.

The measures advocated in the preceding paragraph will, at the same time, solve the problems of *pain*, *restlessness*, and *sleeplessness*. If, however, any sharply localized distress remains, this may be

further combated by the use of ice, or in certain individuals who may possess an antipathy to it, the application of heat in the form of a Japanese oven or electric pad. Where the ice bag is used, it should be taken away one hour out of every three, without fail, since its constant use may bring about tissue necrosis, with resulting anatomic condition wholly analogous to that produced by a third degree burn.

The loss of body fluids must of necessity be compensated, the parenchymatous organs be flushed by way of eliminating toxins, and at the same time, thirst be alleviated. The physical need of fluid not only exists, but has probably been enhanced before treatment began, by the fact that vomiting has prevented fluid reaching the absorbing surfaces low down in the intestinal tract, hence, the prohibition of fluid by mouth merely emphasizes the necessity of introducing it into the circulatory system in some other manner. Since February, 1918, I have employed hypodermoclysis alone for this purpose. For many years I thought I was accomplishing a great deal by the use of the drop-by-drop enema, or proctoclysis. I have been finally forced to admit what I had always been told by well-trained, observant nurses, that the average patient seems to expel just about as much fluid as is introduced into the rectum. Moreover, many patients complain more of this procedure, no matter how careful the rectal administration, than of any other circumstance attending the convalescence, and the expulsion of fluid is consequent upon awakened peristalsis, which as just stated, we so studiously plan to avoid.

There was a time when the intravenous introduction of salt solution was employed by some surgeons in this connection. However, the many dangers attending its use, to say nothing of its other bad features, impel me to dismiss it without further consideration. I do not advocate the use of the brutal procedure which was *formerly* meant by hypodermoclysis. By consulting the special chapter on this subject, it will be noted that I do introduce under the skin any amount desired, continued over any length of time, without much more discomfort to the patient than attends the administration of an ordinary drug, hypodermatically. It must be said, however, that the technic is exacting, and requires continued observation of the patient, something which one affected by the condition we are considering, should enjoy under any circumstances. The minimum amount of water which should be introduced in twenty-four hours, should not be less than 1000 c.c., but if acidosis is to be prevented and toxins properly eliminated, a distinctly

larger amount will be beneficial, varying somewhat with the type of patient. A very thin individual must have more water than a fleshy one whose tissues already contain a comparatively large amount. One caution must be observed in connection with hypodermoclysis; viz., it is possible to overload an already damaged heart by this means, hence one must be on the lookout for an unwonted plethora as evinced early by pulmonary edema and dilatation of the right ventricle.

The feeding of such patients is mentioned merely to condemn any attempt at it. I should not go into the matter at all were it not for the fact that I have seen the rather careless statement given wide publicity, that such a patient's strength must be kept up by careful fluid feeding. We have but to revert to the physiologic consideration of peristaltic rest in order to show how fatuous it is to attempt two diametrically opposed procedures at one time. Of course, no feeding will be attempted at any time until all evidences of acute disease have disappeared, to the extent that it has been possible to cautiously administer water by mouth for twenty-four hours, without producing pain or vomiting. When feeding is finally started, the giving of small amounts of carbohydrate fluids will be indicated in the beginning, for the paramount reason that in this way acidosis is best combated. Tea, coffee and broth, the stock "foodless foods," (W. J. Mayo), of the lazy nurse and the poorly conducted hospital, are absolutely contraindicated under such circumstances. Not only will acidosis have been produced by the infectious process, but by the enforced starvation as well, hence, we must emphasize the need of carbohydrates, as soon as any form of food can be tolerated. This, in addition to the water under the skin and morphine, is our best remedy in this connection.

While of secondary importance, the *wound dressing* is still a matter of moment, at least as far as the patient's comfort is concerned. I long ago found that any form of wound dressing where the drainage is profuse, requires changing very often and the skin must be cared for most assiduously, or such a dressing will soon become a pus poultice, with subsequent dermatitis, furunculosis, etc. Putrefaction is very rapid in a soaked dressing, and the patient complains not only of the actual discomfort due to pathologic changes in the skin, but of the foul odor as well. I have had, as a logical consequence of these observations, the value of the open wound treatment gradually impressed upon me in these cases. Absorbent cotton or wood pulp is snugly stuffed under the side of the patient toward which the drainage fluid naturally inclines, and the wound

receives no attention whatever. The skin of the abdomen is protected from the bedclothing by the metal arches now in common use about every hospital, and if the weather is cold, electric lights are employed, not only by way of conducing to the patient's comfort, but in order to gain the advantage of whatever bactericidal power the rays of an incandescent bulb may be able to exert. As soon as the discharge diminishes markedly in quantity, use the dry treatment during the day only, then for two or three nights in succession, cover the wound with a dressing saturated by a mixture of peroxide of hydrogen, glycerin and water in equal parts. This cleans up an encrusted wound as does nothing else in my experience, a consideration which is highly desirable before the final touches are given by strapping together with adhesive the skin edges wherever they gap apart.

One can conceive of a condition in which it may sometimes be necessary to relieve *intestinal toxemia* during the period in which it is not safe to incite peristalsis. This is best done by puncturing an intestine with a trocar, after stitching it to the parietal peritoneum through a tiny opening, made under local anesthesia. I believe it to be one of those procedures which will not often save the patient in whom it appears to be necessary. In other words, when it is absolutely indicated, my experience has shown that the patient is in a pretty nearly hopeless state. The large majority of my cases that have recovered, did not undergo this procedure, while nearly all others in whom I have resorted to it, have died. I mention it, however, in detail, because it has behind it the weight of such an authority as Fred B. Lund.

To recapitulate, the treatment of septic peritonitis as I understand it and have employed it in numberless instances, consists largely in (1) putting nothing into either end of the intestinal tract, (2) continual washing of the stomach at regular intervals, as long as anything is found in it, (3) giving enough opium to get the physiologic effect, (4) giving enough water under the skin to correspond with physiologic needs, and continuing to carry out these four forms of treatment until such time as the ordinary evidences of an acute inflammatory process no longer present themselves.

(I *anticipate* a possible or expected peritonitis by the observance of these four rules, wherever I encounter an intestinal wound, spill pus, bile, urine or any other infective material, and believe that patients thereby escape many a complication which might otherwise interrupt the convalescence or threaten life itself.)

Encapsulated Peritonitis.—Encapsulated peritonitis is met with very commonly as a consequence of appendix or fallopian tube disease. A patient with a high degree of resistance and an infecting organism of rather low grade intensity, combines them to favor formation of parietal and visceral adhesions, which strictly limit the extent of the exudate. Such a purulent collection may persist for a very long time if resolution is not favored by the proper treatment, consisting of the conservative measures urged in acute septic peritonitis. A source of ever-present danger under such circumstances, is, of course, toxic damage to the various parenchymatous organs. This should always be taken into account in any case which does not quickly return to the normal. The prognosis in these cases is usually for spontaneous resolution, although auto-drainage, either through the skin, vagina, diaphragm or bronchus, to say nothing of that through an abdominal hollow viscus is very commonly observed.

The active *treatment* will vary with the region affected, and the duration of the disease. If the patient is seen within the first week after the onset of such disease about the appendix, the cause will usually be removed and drainage favorable to recovery be instituted, both of them at the same time. So many factors complicate the situation as regards the tubes and other regions of the abdomen, that they can hardly be considered *in extenso* at this time. The problem here would appear to be one of limiting the extension of the process by operative interference, and to this end, one may employ with profit all the various maneuvers detailed in the treatment of acute septic peritonitis. If the cause, e.g., the appendix, be not removed on account of the obvious difficulty and danger of so doing, it is recommended, as Kocher has suggested, that the surgeon wait fully six months before the reopening of the abdomen. By that time, nothing but filmy adhesions will be found, and if all has gone well, a condition surprisingly near to the normal will have been reestablished. At such a time, an interval removal of the appendix can be done without drainage, and the last act in the treatment of the old attack of peritonitis accomplished at the same time we take measures to prevent a reerudescence of the disease.

Chronic Peritonitis.—Chronic peritonitis is really a misnomer, since we refer to peritoneal inflammatory adhesions, varying in extent from a few bands to a more or less complete obliteration of the peritoneal cavity. It is a generally accepted truth that extensive flat adhesions cause no symptoms, while on the other hand, it may be admitted that one sees at very rare intervals a case of mechanical

obstruction due to the formation of a band, after peritonitis. So rare are these cases that I am inclined to regard as little less than criminal, a proposition so frequently made to reoperate a patient for "adhesions." Adhesions are normal occurrences after an opening of the peritoneal or any other serous cavity, and as previously noted, persons with normal nervous systems very rarely experience any difficulty from adhesions. Surely nothing short of absolute intestinal obstruction ever justifies operative interference under such circumstances. But the overenthusiastic operator who has advised surgery for "adhesions," too often imagines that he is going to benefit "nervous" instead of local obstructive manifestations even where positive mechanical obstruction existed. I have, in many instances, by the employment of conservative measures, noted in the chapter entitled Ileus, been able to nurse patients through more than one attack, until what probably were angulating adhesions or constricting bands, loosened up spontaneously. The effort to do this in many cases is surely worth a trial at least. One is forced to remind the chronic operator for "adhesions," that any manipulations undertaken will be followed by more adhesions than those he corrected.

When the peritoneum is affected with *tuberculosis*, the disease may for practical purposes, fall under one or two heads: it may not present a clean-cut picture of inflammatory disease, but be part of a general miliary process, or secondary disease of the lung, in which event one can well term it "tuberculosis of the peritoneum." Tuberculous peritonitis, on the other hand, is the term best applied to this disease of the peritoneum, when it occurs as the only affection of its kind in the body, secondary to tuberculous disease of the fallopian tubes. In this latter condition, there is a large collection of fluid, and there are distinct possibilities of a surgical cure, provided the tubes are removed and the ingress of the tubercle bacilli thereby stopped. Surgery has no place in tuberculosis of the peritoneum, which is part of a general miliary process or secondary to this disease in the lungs. Tuberculous peritonitis was long ago seen to be benefited temporarily by merely opening the abdomen. This was thought by some, to be due to the effect of light, by others, to be a result of the membrane cooling off, by others, to be occasioned by the mere relief of tension after the escape of fluid. It is to the everlasting credit of the Mayos that they were among the first to widely disseminate in this country the knowledge that removal of the tubes alone could result in a permanent cure of this disease where it was due to infections through them.

The after-treatment in tuberculous peritonitis differs radically from that of the acute septic type, and the injunctions which we have to give are largely of a negative nature. In the first place, no such peritoneal cavity must ever be drained under any circumstances. The penalty of violating this rule is a fecal fistula wherever the drain presses upon an intestine, the serous covering of which takes part in the more or less general process. Secondary tuberculous disease of the abdominal wall is very prone to follow a drain tract, with the formation of a sinus wherever the drain has rested. Even where no drain has been employed, secondary tuberculosis of the abdominal wall is not very uncommon as a result of contamination at the time of operation. I have recently had under my charge a case in which superficial tuberculosis of the skin scar healed spontaneously, after nothing but systemic treatment. Such wounds are notoriously slow to heal, hence the abdominal wall should be, if possible, better supported than after other laparotomies. At the same time, the period of rest in bed should be longer than that accorded the usual abdominal cases. All of the various hygienic measures ordinarily employed in the treatment of tuberculosis in any other part of the body will be in order here, since the cure of the tuberculous peritonitis is really a question of the patient's own resisting powers, provided that we merely block up the port of entry for the infecting organism. The surgeon who has such a patient under treatment and considers her to be convalescing, must certainly never be surprised if she dies very suddenly of tuberculous meningitis, during the early reparative period.

CHAPTER LXIX

THE STOMACH IN GENERAL

By Willard Bartlett, St. Louis, Mo.

Before taking up in detail the postoperative care in cancer or in ulcer, the two grand divisions of stomach surgery, certain fundamental factors of anatomic, as well as of physiologic nature, which underlie all the operations done upon this viscus, no matter for what cause, must be considered in detail.

Blood accumulates in the stomach after every operation upon its walls, the amount varying with the situation of the lesion, the character of the patient, and very largely with the technical ability of the operator. This is the first consideration which presents itself in the after-treatment, and as Lindner and Kuettner were the first to emphasize (*Die Chirurgie des Magens*, 1898), is a matter of the most serious import. Under ordinary circumstances, the presence of blood in the stomach is not vital, because, if not vomited, it is propelled along the intestinal tract, very much as is the food, but after an operation upon the stomach, totally different conditions obtain. The organ is temporarily paralyzed and putrefactive changes take place rapidly in any contained blood, with resulting depression, due to absorption as well as to the mechanical disturbance of circulation, respiration, etc., which a dilated stomach always entails. Lavage (Figs. 310-315) performed early and often is the only means at our command for combating the presence of blood in such a stomach. If cold water is used, it tends also to prevent a continuation of bleeding by its stimulating effect upon the musculature of the stomach walls and its blood vessels. I institute this procedure as soon as the suture of the abdominal wall is complete, and repeat it every few hours after operation, until the water returns clear.

Paralysis, as has been mentioned in connection with hemorrhage, is one of the earliest manifestations of the effects of an operation upon the stomach wall. Not only does nothing pass out of this viscus during the early postoperative period, but there is frequently an increased secretion from its mucous membrane, two excellent reasons for unloading it occasionally with the tube, to say nothing of inhibiting absolutely the ingestion of fluids until the motor func-

tion has become reestablished. This reasoning is based upon the knowledge, that no water, and indeed, none of the other fluids ordinarily swallowed, except sugar solution and alcohol, are absorbed by the mucous membrane of the stomach.

The period of functional inhibition varies with the disease, with the character and extent of the operation, as well as with the muscular makeup of the individual; it may be said, however, in general,



Fig. 310.—The paraphernalia employed in stomach lavage.

that it may be expected to end with the expiration of twenty-four, thirty-six or forty-eight hours, or when the stomach is found empty upon the introduction of the tube, three to six hours after the last preceding lavage. In cases of persistent vomiting from any cause, or of dilated stomach, Kanavel (*Continual Stomach Lavage and Continuous Hypodermoclysis in Peritonitis, Persistent Vomiting, with Dehydration and Dilated Stomach, Surgery, Gynecology and Obstetrics*, October, 1916), describes a special kind of tube which

can be put into the stomach by means of a special wire, or the patient swallows the tube, and this remains in place, night and day, without removal, for as high as four consecutive days. Stomach fluid is sucked out every hour, or even less, and sodium bicarbonate or some food put into the viscus. The end of the stomach tube is immersed in a basin of water, and thus a siphon-lavage is kept up.



Fig. 311.—A nonbreakable can. Used at Mayo Clinic.

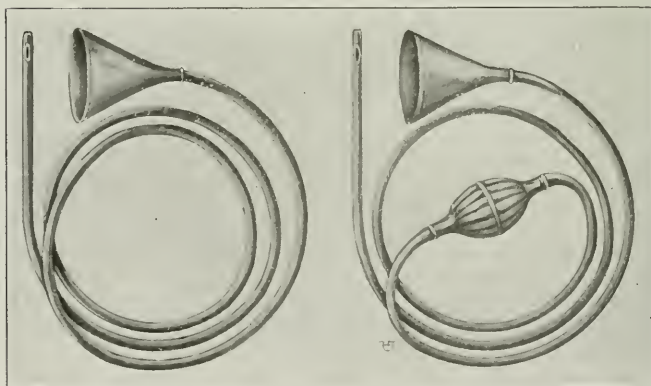


Fig. 312.—Two types of stomach tube commonly employed. Suction is possible with the one to the right.

At the same time, continuous hypodermoclysis is maintained, this especially to be emphasized in dehydration or toxemia. The hypodermoclysis outfit and its use is described in a special chapter devoted to that subject.

The *vicious circle* is practically never seen after latter day stomach surgery. There was a time when this term defined a well-known

syndrome which probably resulted from a variety of conditions produced by technical mistakes on the table, and postoperative neglect, as it would be termed today. When a patient vomited bile continuously until he died a few days after the operation, we were wont to assume, after a gastroenterostomy, at least, that fluids passed out of the stomach through the patent pyloric opening, then ran down through the duodenum, filling the old-fashioned "long loop," and instead of continuing along the duodenum past the new stoma, returned into the cavity of the stomach, and then, th



Fig. 313.—Patient ready for lavage, with adequate protection for surroundings.

portion that was not vomited completed the circle by passing out through the pylorus, and so on once more. With the improvement of technic some years since, especially by the adoption of the "short loop" and "no loop" operations, this one source of complication was rendered unlikely and now we must blame some other factor in the technic and after-treatment, if constant regurgitation occurs during the first days which follow the operation.

Where a "long loop" must be used, at the present time the only adequate treatment for this consequence of it, is secondary entero-enterostomy, which is readily accomplished with a Murphy button

or suture under local infiltration anesthesia. In the rare instances where this complication follows the more modern "short loop" gastroenterostomy, the technical difficulties of short circuiting the bowel are so great as to make a special technic indispensable. This was supplied by me a few years since, in an article entitled "The Use



Fig. 314.—The tube in position for emptying the stomach.

of a Murphy Button to Effect Duodenojejunosotomy after Gastrojejunosotomy," *Annals of Surgery*, 1913. The two halves of a Murphy button (Fig. 316) are carried by the transgastric route, through the posterior gastroenterostomy (Fig. 317), one into each loop of bowel, and then invaginated, thus short circuiting the distended

loop. If the patient has not been allowed to suffer too long before the secondary operation is performed, there is a prompt response, so far as subsidence of symptoms is concerned, and the patient makes a satisfactory recovery.

It is a matter of the utmost importance for the operator to



Fig. 315.—The patient holds the tube in place and a water trap is maintained in raising and lowering it so that air is not sucked into the stomach.

realize that a gastroenterostomy stoma functionates under circumstances which are in keeping with physiologic laws, and that it does not merely drain the stomach in a mechanical manner, as though that viscus were an inanimate bag. We have long known, clinically, that a new opening drains the stomach with complete

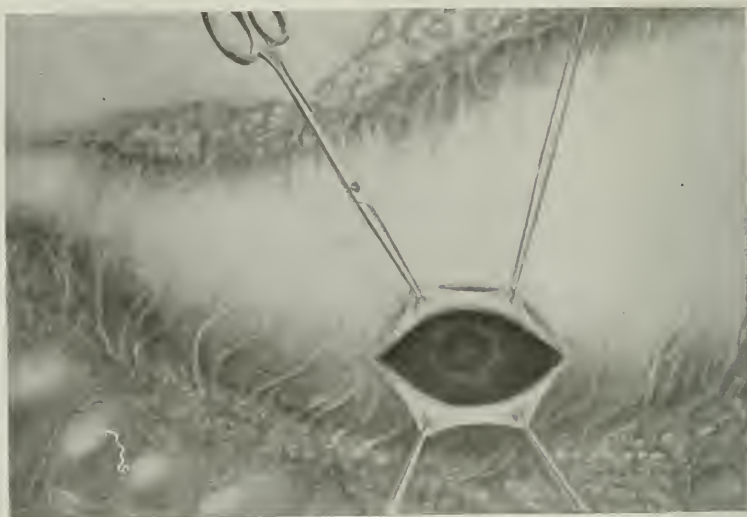


Fig. 316.—The incision in the anterior wall of the stomach allows access to the gastroenterostomy opening in the posterior wall. (After Mayo.)

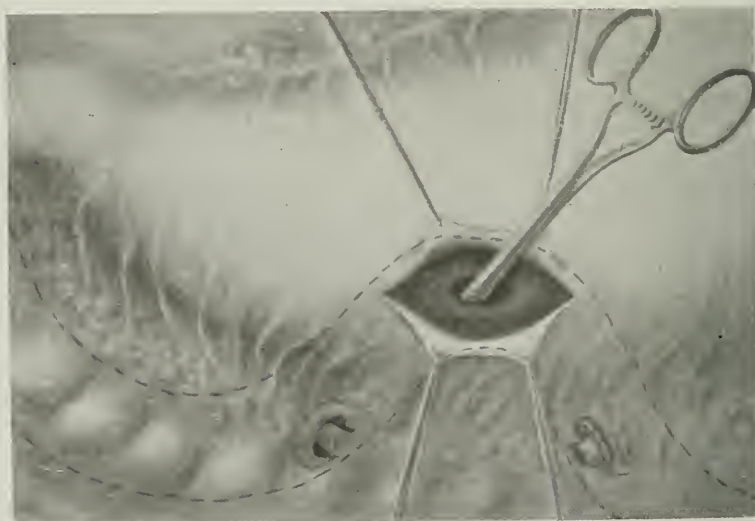


Fig. 317.—The two halves of a Murphy button have been introduced by the transgastric route, caught the two portions of bowel contiguous to the gastroenterostomy opening and will be telescoped in order to short-circuit the loops for the treatment of vicious circle.

satisfaction after the pyloric ring has become closed by disease, but it was not until the introduction of x-ray bismuth studies, that we realized what a large percentage of stomach contents is propelled by the stomach muscularis, right past a new gastroenterostomy

opening, and out through the pylorus in the normal manner, so long as the preformed pyloric opening remained patulous. Hence, it comes about that in many instances, an *anastomosis* which originally delivered a portion of stomach contents, or perhaps, none at all, *gradually closes* completely, or almost so in the presence of an open pylorus, while the patient who has been subjected to a needless operation, instead of being improved, is worse off than before operation on account of crippling adhesions and visceral distortions.

Exclusion of the pylorus has been practiced in a variety of ways, since we learned that many a stomach is drained efficiently by a new opening, only in the presence of a closed pylorus. Without going into technical details, it seems fairly safe to assume that there is only one way of doing this effectively, and that is by cutting the viscus in two at some point, and closing up the two blind ends with sutures. It is rather difficult to state just the circumstances under which permanent exclusion of the pylorus is desirable. It is a very considerable surgical procedure, and Dr. H. W. Soper has observed, in more than one instance, that the operation, where it is done proximal to the pyloric ring, results in the body of the stomach being dislocated downward, with serious motor impairment in consequence.

Nature shows such marked tendency to keep the mucous membrane lined canals of the body patulous, that we are not surprised to observe the pylorus opening up secondarily, after attempts have been made to close it in other simpler ways. It may perhaps be just as well that most of such closures are temporary, since surgeons of greatest experience in this line are rather prone to agree that it does not make much difference in the treatment of ulcer, at least, whether or not the original gastroenterostomy opening is complicated by an attempt at pylorus exclusion. This is probably explained by the fact that the spasm which an ulcer causes, keeps the pylorus nearly enough closed to allow of surgical drainage, until the period of ulcer healing is past.

A complication which follows a *gastroenterostomy made too far from the pylorus* has been observed recently by R. Walter Mills, who finds, in one patient at least, very marked sacculation of the stomach on the greater curvature side, midway between the pylorus and the new opening. The clinical picture in this instance so nearly approximates that which was presented by the ulcer prior to the operation, that the two could scarcely have been distinguished had it not been for x-ray bismuth studies. Such sacculation and retention must always be considered in the postoperative care of a gastro-

enterostomy patient, who does not make a satisfactory convalescence.

It may be stated in passing that the now rarely used "Y" *gastroenterostomy* of Roux is followed by two characteristic complications, as might be readily supposed. This the most extensive procedure of its kind is attended by the formation of so many adhesions as to cripple the affected viscera. In the second place, the two end-to-side anastomoses are small to begin with and tend to contract so that they almost uniformly result in stenosis.

An interesting and little understood mechanical complication following a "V"-shaped excision of the minor curvature, is obstruction which usually persists until the patient's death, unless relieved by a secondary gastroenterostomy rather promptly. As a matter of course, this complication is no longer frequently observed, since we have now learned to make an anastomosis coincidently with this somewhat rare operation.

Too large a gastroenterostomy opening has serious defects. It may drain the stomach too rapidly, or on the other hand, any excess in its diameter over that of the bowel into which it opens, will result, according to Kelling, in the opposite wall of the smaller viscus prolapsing through the opening into the stomach cavity, thus kinking the bowel and forming a spur at the site of operation. The only postoperative treatment of this condition, consists in short circuiting the lesion.

Ulcer of the Stomach.—If we are to accomplish satisfactory results after operations upon the stomach, we must stop classifying our efforts according to the operation performed, and center our attention upon the pathologic entity which confronts us. No matter what form of technic has been employed in the treatment of ulcer, we must have as our guiding principle of after-treatment *the prevention of another ulcer*. The patient who has once had an ulcer, can never be regarded as a normal individual. He possesses *the ulcer tendency*, and can never hope to abuse his stomach, with immunity, as the rest of us seem capable of doing, hence, we should always inform such an individual during his hospital stay, that *adequate treatment begins with the operation, instead of ending with it*.

The unique problem which confronts all in the after-treatment, as well as in operative handling of ulcer, should be based upon a true appreciation of the danger of *superacidity*. Patterson of London believes that a gastroenterostomy cures an ulcer rather on chemical than drainage grounds, reasoning that we turn alkaline

intestinal contents into the stomach, whenever the operation is done, and thus constantly hold down gastric and upper duodenal acidity. No doubt, there is something to the theory, although most surgeons of experience have held that drainage and rest of the ulcer area are the matters of special importance.

"Among various therapeutic measures instituted for the cure of gastric and duodenal ulcer (Gastric and Duodenal Ulcer, The Influence of Operative Procedures on Gastric Motility and Secretion, Walter W. Hamburger and James J. Leach, (Chicago), surgical procedures have been inaugurated in constantly increasing frequency. These surgical procedures are legion; they possess inexhaustible variations and modifications; they are constantly being supplanted by new models and new styles. Seant inquiry is devoted to the ultimate results of these operations, little thought to the permanent relief of symptoms, to the healing of the ulcer and the prevention of recurrences, and no consideration to gastric function, particularly gastric motility and secretion.

"1. Operative procedures on stomachs with normal motility and secretion frequently produce stasis, hypersecretion or both.

"2. Stasis may be caused by pylorospasm, by contents stranded below the level of the gastroenterostomy opening, or by contents held between the opening and the pylorus.

"3. Hypersecretion may occur coincidentally or secondarily to stasis, but also independently, as a true postoperative hypersecretion, similar to the same conditions in dogs. This hypersecretory period is probably due to operative trauma, and is likely to be temporary. Postoperative hypersecretion explains certain discrepancies between bismuth and motor meal findings.

"4. Operative procedures on stomachs with delayed motility and hypersecretion usually reduce motility to normal (but not beyond), and lower hyperacidity. This is particularly true if the pylorus is closed. If the pylorus is left patent, vicious circle, stasis in duodenum, spasm or secondary contracture of the opening are liable to continue the abnormal gastric function or to increase it.

"5. Nonrelief from surgical interference in gastric and duodenal ulcer is due to (a) lack of properly placed surgical indications; (b) lack of thorough and prolonged preoperative medical treatment; (c) failure to devise the proper surgical procedure to meet the individual case, and (d) lack of prolonged *postoperative* medical treatment."

The matter of most especial importance in the after-treatment of an ulcer patient, is *dict*. I absolutely never allow one of these

patients to have tea, coffee or broth while in the hospital, and it is well known that every unthinking nurse or lazy dietitian will supply these three fluids, unless the contrary is ordered, even though, presumably, all three tend to increase hyperacidity.

Dr. J. W. Larrimore, in his course on dietetics in Washington University Medical School, states that "After any laparotomy, the rule most usually given is for starvation, for at least twenty-four hours, and for even two to three days. When the *stomach itself is operated*, the rule is given for four to five days of starvation, and the use of rectal feeding."

There is usually an increased secretion in the stomach after an anesthetic, which produces the nausea and vomiting even in small amounts. With only this small amount of fluid, the retching and vomiting is harder and more disturbing than if sufficient fluid were present to allow a full and free accomplishment of the act of vomiting. I can see no reason why fluids should not be allowed in small quantities immediately following an operation. This is stated as a general principle, for it is easily seen how certain cases may not tolerate even this. Unless something untoward occurs there is no reason why on the following day a very simple diet of small, frequent amounts should not be given. This is true even after gastro-enterostomy. The following surgical diet is formulated according to these ideas and is very conservative. It has been used as a routine with great advantage and satisfaction in several hospitals in St. Louis.

POSTOPERATIVE DIET

<i>Preparation:</i>	3% glucose as proctoclysis, continuing from noon until morning of operation.
<i>First Day:</i>	3% glucose as proctoclysis. Water, small sips, <i>ad lib.</i>
<i>Second Day:</i>	X grains of sodium citrate in ii ounces of water, every 3 hours. Junket or oatmeal jelly (ii ounces) at a feeding, every 3 hours; to alternate with sodium citrate solution. Continue 3% glucose as proctoclysis.
<i>Third Day:</i>	Feed every 2 hours, alternating junket, oatmeal jelly, or Bulgarian milk and cream ($\frac{2}{3}$ and $\frac{1}{3}$); ii ounces at a feeding. (One or two feedings during the night if awake.)
<i>Fourth Day:</i>	Feed every 2 hours. Same as on third day, plus custard, blanc-mange; gelatine, served with sugar of milk and cream. One seven minute egg. 7:00 A. M. One seven minute egg. 9:00 A. M. Oatmeal jelly.

11:00 A. M. Custard.

1:00 P. M. Junket.

3:00 P. M. Blanc-mange.

5:00 P. M. Bulgarian milk.

7:00 P. M. Gelatine.

(This sequence may be changed.)

Fifth, Sixth

and Seventh Days: Increase quantity to iv ounces with feedings 2½ hours apart. Same ingredients.

Junket, oatmeal jelly, custard, blanc-mange, and gelatine, to be made up with sugar of milk (no cane sugar used in list.)

The progression in diet beyond this list will usually be governed by other than the operative considerations. Postoperative measures must include quiet, comfort, and control of hygiene.

After the first week the ulcer patient is placed on a diet list for which we have also to thank Dr. J. W. Larrimore:

1. Begin this diet by using articles lettered "a" for two days and then add slowly during two or three days the articles lettered "c."
2. Do not use articles lettered "c" if they cause any discomfort or increase in your symptoms.
3. Eat slowly and chew thoroughly.
4. Use no very hot or very cold foods or drinks.
5. Do not eat or drink anything *not* on this list.
6. Use butter and cream freely.
7. In case of sudden severe pain or hemorrhage take nothing into the stomach and call your physician.

Breakfast:

- (a) Well cooked cream of wheat, oatmeal (strained).
- (a) Cup of hot water and cream.
- (c) Farina, or a well-softened shredded wheat biscuit.
- (c) Eggs, soft-boiled or poached.
- (c) Toast and butter.

At 10 a. m.:

- (a) Glass of one-half fermillae and cream, or bread and milk.

At Noon:

- (a) Strained milk soup of potato, celery, pea, etc.
- (a) Milk toast (warm) crackers and milk, bread (crumb) and milk.
- (a) Toast and butter (not fresh white bread).
- (a) Cup of hot water and cream.
- (c) Eggs, soft-boiled or poached.
- (c) Mashed potatoes with cream.
- (c) Warm apple sauce.

At 3:30 p. m.:

- (a) Same as at 10 A. M.

At Night:

- Same as at noon, except no soup, and there may be added:
- (a) Custards, gelatine, jello, blanc-mange, cornstarch.
 - (c) Creamed chicken or squab, stewed sweetbreads or calves' brains.

At 8:30 p. m.:

(a) Toast and butter, or milk toast.

(a) Custards, gelatine or cornstarch.

(a) Cup of hot water, flavored with cream.

Avoid strictly all condiments, such as mustard, horse radish, catsup, etc.

Use very little sugar, very little salt and no pepper.

The foregoing list is followed not only during the patient's second postoperative week, but from four to eight weeks following his departure from the hospital. If he gains weight by using it, nothing further is added for some time, but if the hemoglobin be low, spinach and carrots are carefully strained through a sieve and added, each of them to one meal a day. In the course of time, we add a puree of all the other vegetables, and then some of the more digestible cheeses, later on, the less highly acid fruits, previously cooked, and last of all, when there is a total absence of symptoms, a small amount of broiled mutton chop, or broiled seraped beef, not to exceed once each day. Fish, if properly prepared, may vary the list at this time.

Upon the reappearance of symptoms, the patient instantly returns to line No. 1 on the diet list, and very cautiously resumes the original routine, as he did the first time.

Secondary ulcers at the stoma, in the stomach wall, or in the jejunum, have in the past, perhaps, been more common than is usually believed. I can not do this subject justice better than by quoting Carman and Balfour (*Gastrojejunal Uleers, Their Roentgenologic and Surgical Aspects*). "In any case in which gastroenterostomy has been performed for symptoms due to a definite demonstrable lesion and has been followed by comfort for a varying period, and then by recurrence of certain or all the symptoms in greater or less degree, to determine the cause of the recurrence often occasions considerable perplexity. Without discussing the various possible causes, we wish to refer to the fact that the occasional disappointing result is due to the development of another ulcer in the vicinity of the gastroenterostomy. Of greatest interest, in the findings, has been the discovery of strands of unabsorbed permanent suture material, in six of the thirteen cases. This retained suture material may have constituted an important etiologic factor. "The general plan, therefore, in the light of our present information is to expose the line of anastomosis by either a transgastric or transjejunal incision, search for retained suture and for the ulcer, remove both, the latter either by itself or with the entire anastomosis. If the anastomosis is constricted, and en-

largement is possible and safe, such treatment is satisfactory; if, however, much induration and infection exists, excision of the anastomosis, closure of openings, and gastroduodenostomy are indicated."

Jejunal ulcer is further elucidated by Richardson (Jejunal Ulcer: A Report of Two Cases Treated by Resection and End-to-End Anastomosis of the Jejunum, *Boston Medical and Surgical Journal*, Jan. 25, 1917). "The first case was reported by Braun in 1899. Since then numerous reported cases have been collected by various authors: Watts, Brodnitz, Mayo Robson, Tiegel, Gosset, Connell, Patterson, Schostak, v. Roogen, etc. In 1914, Schwarz collected 146 cases, including ten of his own.

"Conclusion: Jejunal ulcer may occur after posterior short-loop gastroenterostomy. Persistent pain, following gastrojejunostomy, especially if accompanied by local tenderness over the stoma, should suggest jejunal or gastrojejunal ulcer. Such ulcers are characterized by a tendency to deep penetration. Surgical treatment undertaken early is likely to be less dangerous and more effective."

As will be seen from the foregoing, no surgeons are inclined to immediate operation in these instances. We have, in such circumstances, always inclined to first try the well-known Sippey treatment, which consists of small, frequent fluid feedings, the extensive use of alkalis, facilitation of drainage by emptyings of the stomach, and absolute rest in bed in the hospital. For the details of the method, which are of the utmost importance, the reader is referred to Sippey's numerous writings on the subject.

We must not leave this subject without a mention of the post-operative treatment where an ulcer has perforated and then been operated on. However, a word here will suffice, since the problem resolves itself into one of peritonitis, which has been taken up in a separate chapter devoted to the subject.

Cancer of the Stomach.—The problem of cancer of the stomach here is one totally different from that outlined in the preceding chapter. The problem of acidity does not interest us at all, neither have we any hygienic or dietary measures influencing a recurrence of the lesion, matters of prime importance in the consideration of ulcer. It is, then, the nutritional aspect which here claims chief attention. Such a patient must be built up, and I know of no better way to do this than by keeping the individual, as much as possible, in the fresh air, and by following a daily routine, patterned after the following diet list, which was compiled by Dr. J. W. Larrimore, to whom we are indebted for so many things that are useful along

nutritional lines. It is employed after the first postoperative week detailed above under ulcer.

1. Eat all that is possible at each meal.
2. Rest, lying down one and one-half hours after each meal.
3. Eat one-fourth pound of butter and one-half loaf of bread each day (or more), and drink at least one pint of cream.
4. Eat slowly and chew thoroughly.
5. Do not eat or drink anything else.
6. Sponge and exercise upon arising.
7. Observe carefully and regularly the need of a daily bowel movement.

Breakfast: Well cooked cream of wheat, oatmeal, farina or shredded wheat biscuit, with cream and sugar of milk.
Two eggs, soft-boiled or poached, bacon, fried, medium.
Toast and much butter.
Cup of half hot water and half cream or glass of half milk and half cream.

Rest.

At 10:30 a. m.: One large glass of half milk (or buttermilk) and half cream or glass of half fermillae and half cream.

At Noon: Vegetable milk soup, strained, creamed and thickened with flour, of potato, pea and celery.

Two eggs, soft-boiled or poached.

Creamed vegetables, (thoroughly cooked): green peas, carrots, well-cooked rice, mashed or baked potatoes, with butter.

White bread or toast with much butter.

Apple sauce, baked apple pulp, stewed peaches.

Cup of half hot water and half cream, or glass of half milk and half cream.

Rest.

At 4:00 p. m.: Glass of milk and cream or fermillae and cream.

At Night: Same as at noon, except no soup: may add one medium portion of tender baked or broiled mutton, chicken, squab, steak, lamb chops, gelatine, blanc-mange, corn-starch, prune whip, tapioca, sago, ice cream.

Rest.

Use no condiments, very little salt or sugar, except sugar of milk, which may be used freely with cereals, and may be obtained from a druggist.

Noon and night meals may be exchanged.

The matter of *wound healing* is one which is not infrequently disturbing, especially after extensive resections for cancer of the stomach. The utmost care must be observed in protecting all exposed tissues, since the infection by stomach contents is here particularly high, due to the fact that in cancer there is little or no

acid to inhibit the growth of all sorts of pathogenic germs. An ulcer operation, no matter how extensive, is rarely attended by any peritonitis or other form of wound infection, because the high acidity of stomach contents, which may soil some tissue surface, makes it certain that there will be very few active bacteria present. Unfortunately, this is almost never the case in cancer, and certainly not so, unless the disease is in its earliest stages.

Metastatic Pneumonia was quite common in the early days of resection for cancer, because cut surfaces became infected and transmission of germs along a relatively short route, led to secondary deposits in pulmonary tissue. Since the introduction of the cautery in stomach surgery, and the division of all visceral and lymphatic structures by this instrument, we no longer see these metastatic pneumonias with anything like the frequency which once obtained.

It is fair to suppose that the metastatic spread of cancer is also inhibited in the manner just described.

Radioactive stomach contents seem to have been of the utmost use in some instances, so far as inhibiting recurrent growths is concerned. I have in mind, in my own experience, an elderly lady on whom a resection was done, with the happiest immediate result. Some months later she returned with a palpable tumor at the site where the transverse division of the great curvature was supposed to have been made. There was no evidence of obstruction or any other symptom, except the presence of the mass and progressive emaciation. The only treatment employed consisted of exposing the stomach, filled with barium, to intensive doses of x-ray, the idea being to render the stomach contents radioactive. In the course of a few weeks, the mass had totally disappeared. The lady gained twelve pounds in weight, and two years after the experience, she is in her accustomed health and seems to be a living proof of the efficiency of this form of treatment.

The postoperative care in stomach cancer is a comparatively simple matter when a resection has been made early in the course of the disease. If the growth is limited to the pyloric region, so that obstruction has permitted of an early diagnosis, not only is the mechanical difficulty relieved, but the patient is in many instances permanently cured. However, the matter is quite a different one when, by reason of inaccessibility or extent of the process, a resection offers a doubtful ultimate prognosis, or is, indeed, not made at all, and a gastroenterostomy for drainage deemed advisable. Men of widest experience prefer to resect if the risk to life be not too great, even though an ultimate cure can not be promised, be-

lieving that few cancer patients can be comfortable after a simple drainage gastroenterostomy, when a cancer is sloughing into the cavity of the stomach. Of course, a simple drainage operation gives marvelous temporary relief, where obstruction is the sole indication for surgical treatment. However, the average of many statistical tables which have been compiled upon this subject, show that the patients with incurable cancer of the stomach have an average existence of about two years after resection, while only about one-half this time elapses before the same class of patients die, following a gastroenterostomy.

When a patient leaves the hospital, no matter what has been done, the subsequent convalescence is, it appears to me greatly facilitated by following a routine which Dr. Stuart McGuire has originated. He has long made it a practice to send out such a patient with a copy of the following printed instructions in his possession:

You have been instructed regarding the condition of your wound and all further dressings that are required should be done by your local physician.

You do not need an abdominal binder or special type of corset.

Your diet should be carefully regulated for several months. This does not mean, however, that it should be unduly limited. On returning home, you should promptly put yourself under the care of your physician. He is fully acquainted with what has been done for you at the clinic, and can help you to get well by his advice and counsel.

You should have ample nourishment of a wholesome kind, but not large meals. Five small meals a day are better than three large meals.

Acids and highly spiced foods should be avoided. Unusually coarse food, such as celery, tough meats, stringy vegetables and the like are apt to be irritating. Milk and buttermilk are well suited to your case. A well-balanced dietary of meats, fish, eggs, vegetables, bread and butter, light desserts, may be taken under the supervision of your physician.

Water should be taken freely but not forced.

Alcohol in all forms is best avoided.

Tea or coffee may be taken in moderation.

The use of tobacco should depend somewhat on your former habit. Decrease rather than increase. The least amount used is always too much.

Put aside care, especially at meal time. Avoid rapid eating and chew the food thoroughly.

Careful attention to the toilet of the mouth should be exercised. Use a tooth brush and antiseptic mouth wash both night and morning.

The bowels should be regulated as far as possible by natural means, such as proper diet, an abundance of drinking water, sufficient exercise, and the establishment of a regular hour of going to stool. Mild laxatives should be employed when necessary. (Squibbs mineral oil to be greatly preferred.—Bartlett.)

Tub baths are not objectionable.

You may begin with a short walk immediately, the distance of two or three city blocks, and increase gradually as your strength permits.

Avoid excessive fatigue, mental strain, undue annoyance and excitement.

A sufficient amount of rest should be obtained by retiring early and lying down once or twice during the day.

You should expect to devote the next few months to measures directed to the complete restoration of your health. A gain in weight is desirable, and speaks well for your favorable progress.

Please report your condition by mail at the end of three months. If you are well the information will help us, if you are not well we may be able to help you.

CHAPTER LXX

THE INTESTINES

By Willard Bartlett, St. Louis, Mo.

It may be stated in general that the convalescence of a patient who has had an operation on the large intestine is a matter of greater solicitude than that of one whose small bowel has been involved, by reason of two factors which are inherent in the functioning of these viscera. In the first place, the large bowel contains very many more virulent microorganisms than does the small, hence, primary soiling or secondary escape of the contents of the large intestine is a very much more serious matter than if it be from the other. In the second place, a suture line in the larger viscus, especially if it be located anywhere near the rectum, is exposed to the traumatic effect of solid or semisolid feces passing over it, whereas, the upper intestinal tract contains at all times, a thin, pasty semi-fluid mass. A third factor, which should perhaps not be overlooked, is the possibility of postoperative injury of the large intestine, due to well-intentioned but misdirected efforts to stimulate the peristaltic functions by postoperative voluminous enemata. While the upper intestine is susceptible to a somewhat similar injury by the injudicious use of cathartics, still, the danger is probably less serious, if above the ileocecal junction than below it.

The vital consideration in the immediate after-treatment of a patient who has had an intestinal operation has to do with the use of *foods and cathartics*. This was a more or less sketchy matter until 1899, when Chlumsky placed this matter once for all on a firm foundation, as a result of experimental work in hydrodynamics. He made intestinal anastomoses on dogs, and at periods ranging from one to fifteen days, made manometric measurements of the intra-hydraulic intestinal pressure required to disrupt the wound. He found immediately after a double row suture anastomosis, that the wound would withstand about one-third the pressure required to burst the normal intestines. This ability on the part of the wound to resist water pressure sank greatly during the first four days, until at the end of that time it reached only about one-third what it had been immediately after the sutures were inserted. On the fifth day the resistance began to increase, and by the end of the

seventh day it had become as great as it had been immediately after the operation. By the end of the tenth day, the resistance to increased pressure within the lumen was so high that the intact bowel wall ruptured about the time the wound gave way. By the end of the fifteenth day, the new scar was stronger than the normal intestinal wall in each instance.

Much astonishment was manifested by surgeons when the results of Chlumsky's experiments had been learned. However, the explanation of them is exceedingly simple. During the first two days, sutures hold only mechanically by their mere presence. Then from the second to the fifth day they begin to cut, because the deposition of granulation tissue about them renders the tissues more or less friable. After the fifth day granulation tissue is being transformed into cicatricial tissue, with the result that the stitches hold with increased resistive ability until about the fifteenth day, when the process is relatively complete. From the foregoing, the very elementary practical conclusion may be drawn, that it is highly dangerous to administer solid food or a cathartic within the first seven days subsequent to the repair of an intestinal wound.

It is rather difficult to form an exact estimate regarding the amount of the intestinal tract which can be removed without incurring the danger of ultimate *fatal deficiency symptoms*. There are a number of circumstances which must be taken into account, the principal one of which, being the location of the lesion. The higher up the involvement of the small bowel, the more serious the concern, since its absorptive and digestive functions decrease the nearer we approach the ileocecal valve. On the other hand, the patient who dispenses with the entire large intestine, without succumbing to the immediate effects of the operation, although he usually suffers some temporary diarrhea, ultimately compensates for the loss by virtue of the fact that the ileum assumes the status of a modified colon, and apparently the patient is just as well off as before the operation.

Many enthusiasts, who follow Sir Arbuthnot Lane's example, believe we would all be far better off without the colon, and it is only fair to state in this connection, that so celebrated an investigator as the late Professor Metschnikoff made stool examinations from patients who had been operated on by Lane, and declared himself unable, when this had been done at a remote period, to detect any material difference between the stool of a normal individual and one who had lost the colon.

It is generally assumed that one can, without very serious concern, lose somewhat more than the lower one-half of the intestinal tract. However, it probably takes very prolonged observation before any definite statement can be made in the individual case, since these patients frequently get over the primary diarrhea and then remain in a fair state of health for some years, later gradually declining and dying without any definite reason for the outcome being apparent.

The first *complication* to be experienced after an intestinal operation, no matter what the nature, is temporary paresis of the bowel, due to the inhibition which nature places on every damaged, hollow viscus, with a view to prevent it dumping its contents into the peritoneal cavity. No doubt, this paresis is increased by handling, pressure of gauze pads and the crushing influence of elastic clamps.

Peritonitis, resulting from soiling, is, of course, the most frequent cause of intestinal paresis, and since no operation on the intestinal tract is possible without at least a very minute contamination of serous surfaces, one must regard this postoperative development as an almost normal consequence of the operation. Since the treatment of it is taken up *in extenso* under the caption of Postoperative Ileus, I shall refer the reader to that section of this work for the further details.

Faulty technic sometimes results in an operator *inverting too much* of the intestinal wall into the lumen, during his attempt to approximate serous surfaces, if the operation be an end-to-end anastomosis. This results in the formation of a diaphragm which may lead to a complete mechanical intestinal obstruction. Reoperation will probably be necessary under such circumstances, although for details, reference is again made to the chapter on Ileus.

A *stricture* is a somewhat uncommon, although quite possible complication of any intestinal anastomosis. It is not at all likely, provided the contents have no other route than that through the new opening. This normal process will keep patulous any but a particularly constricted opening. We can think of an instance in which too much diaphragm has been left, where permanent suture material communicating with the lumen of the gut has led to extensive infection of the intestinal wall with scar formation, and where soiling has led to the deposit of a heavy ring of fibrin, with ultimate extensive ring scar formation. All of these resulted in so great an encroachment upon the canal as to produce ultimate mechanical obstruction. Reference is again made to the chapter on Ileus.

Circulatory disturbances in the bowel itself are not very common after surgery done upon this tract, since adequate care of a healthy mesentery and oblique section of intestinal walls will usually obviate anything of the kind. It will, however, be readily understood that obstructive symptoms are certain to supervene if the nutrition of an intestinal segment is cut off as a result of obstruction in mesenteric blood vessels. Perhaps the most common of circulatory disturbances result from limited necrosis of the intestinal wall opposite the mesenteric insertion after cross section of the gut, followed by end-to-end anastomosis. Unless adhesions have completely sealed up the area, leakage of bowel contents is almost sure to supervene. It is for this reason that lateral anastomosis is very considerably safer than the end-to-end variety, in the hands of any but experienced and expert operators, even though the latter form of operation gives a somewhat better anatomic, as well as functional result.

There is one characteristic complication of the lateral intestinal anastomosis, which can be obviated by proper technical manipulation on the operating table. The new opening must extend clear into the blind ends of gut. There must be absolutely *no blind pouch* left on the proximal stump, otherwise, bowel contents will tend to be driven beyond the stoma, accumulate in the blind pouch, distend it, and sometimes cause an intestinal fistula to form. We know of one instance in which a lateral anastomosis between the lower ileum and the transverse colon was created, after the hepatic flexure had been resected. In consequence of this a fistula formed between the ascending colon and duodenum, with the result that a small amount of feces and lower intestinal gas could be vomited up, or washed out of the individual's stomach, on many occasions.

A singular complication happens with the use of a Murphy button: After it has done its work and cut through, it will always drop *into the larger* of the two viscera which have been connected by it, regardless of the fecal current. This is, however, not usually attended by serious concern, provided only that the patient does not learn of its retention.

The same thing must be said of the size of a lateral anastomotic opening as is made in gastroenterostomy; viz., that it must not be larger in diameter than the cross section of the smaller of the two viscera which it connects. Otherwise, the wall of the smaller viscus, opposite to the new opening, will *prolapse through* into the lumen of the larger one and result in kinking of the smaller, with spur formation.

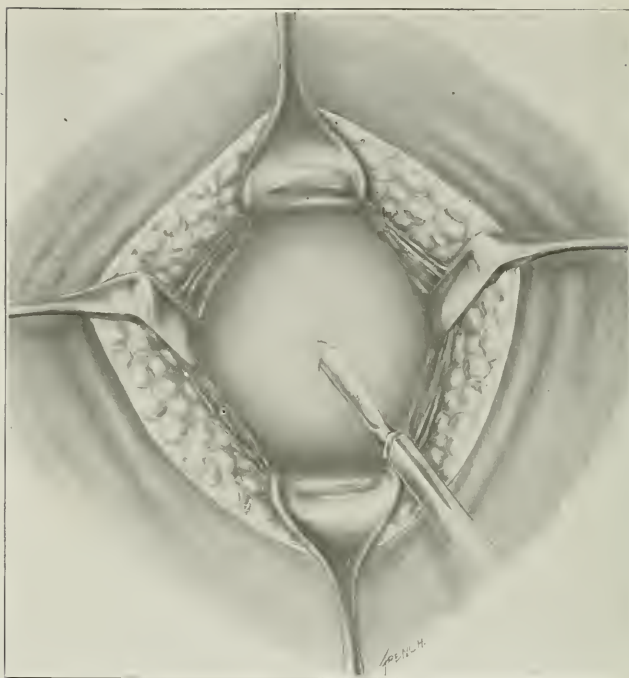


Fig. 318.—Opening fascia and peritoneum in making drainage fistula.

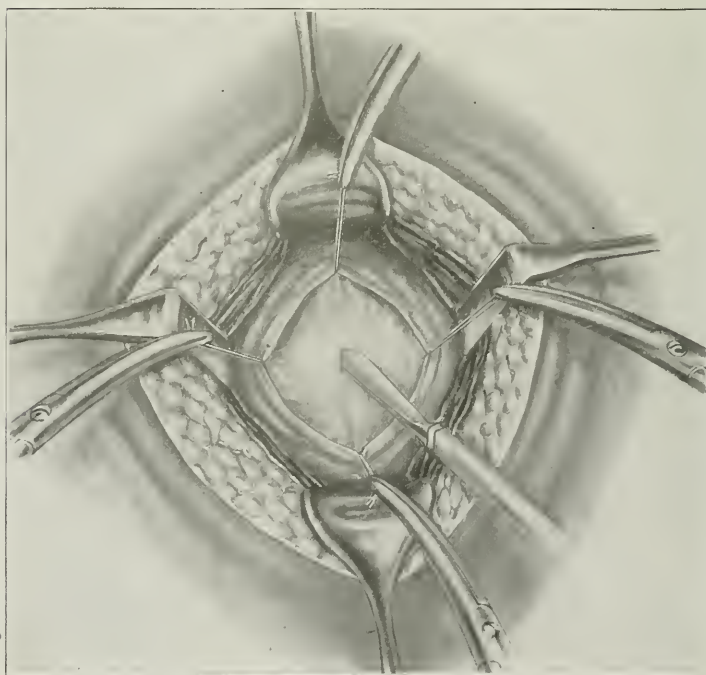


Fig. 319.—Attaching the bowel to fascia and peritoneum before opening.

A rather rare complication of intestinal surgery results from the fact that a *slit in the mesentery* is not always properly repaired at the time an anastomosis is made. In consequence of this, a loop of intestine finds its way through this new opening, and the conditions which constitute an intestinal hernia, are at hand. As is naturally supposed, obstruction may be produced as a result, and the individual be lost for the want of a few mesenteric sutures. Of

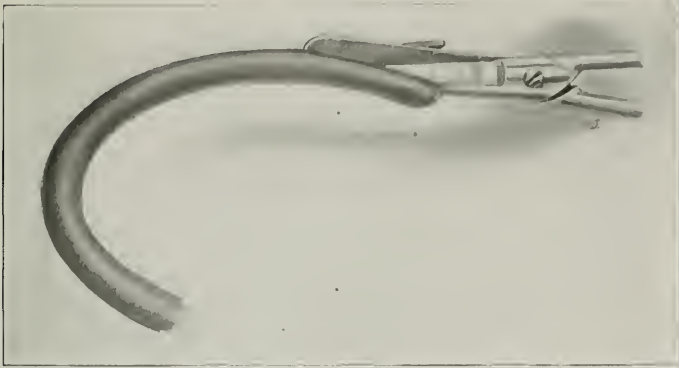


Fig. 320.—A drainage tube split at its inner end.



Fig. 321.—The drainage tube held in forceps and ready for introduction.

course the only adequate treatment for such a condition is along operative lines. It may be said, however, that the picture which confronts one under such circumstances, is puzzling in the extreme, and the task of restoring conditions to anything like the normal is attended with the greatest difficulty.

For the sake of completeness *intestinal feeding* is merely mentioned here, and will be treated in full under an appropriate chapter.

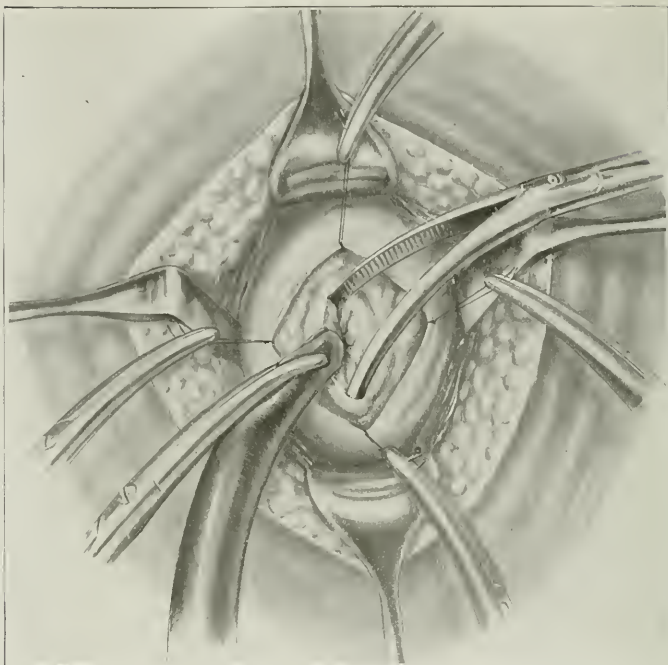


Fig. 322.—Bowel held open with forceps while tube is being introduced.

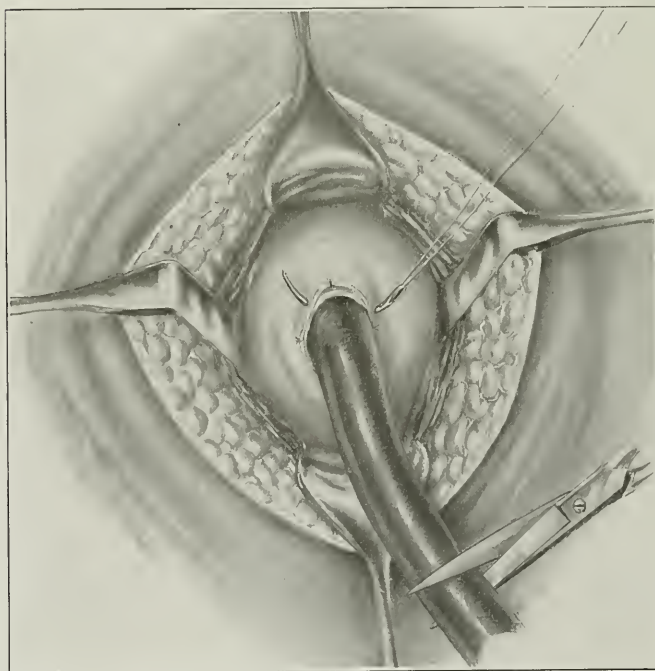


Fig. 323.—The tube anchored in the bowel.

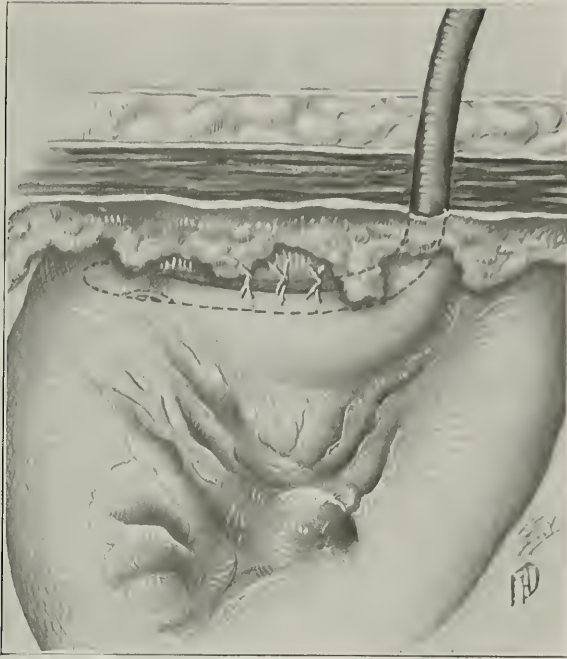


Fig. 324.—Tube passing through abdominal incision and the omentum into the lumen of the bowel. (Mayo Clinic.)

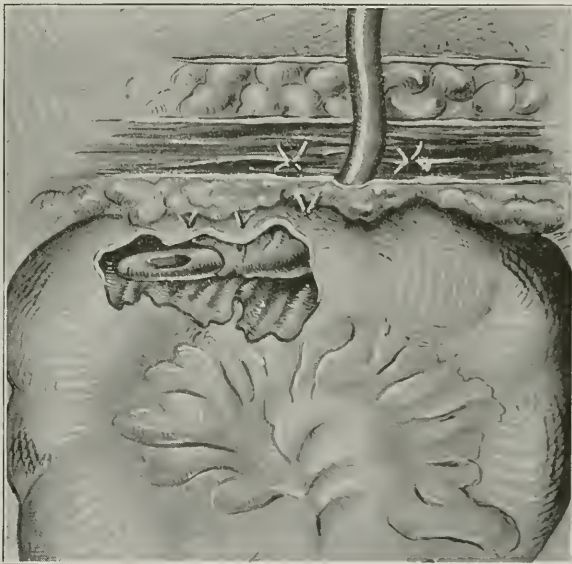


Fig. 325.—End of tube shown in bowel. (Mayo Clinic.)



Fig. 326.—The artificial anus resulting from two stage colon resection, showing the spur.

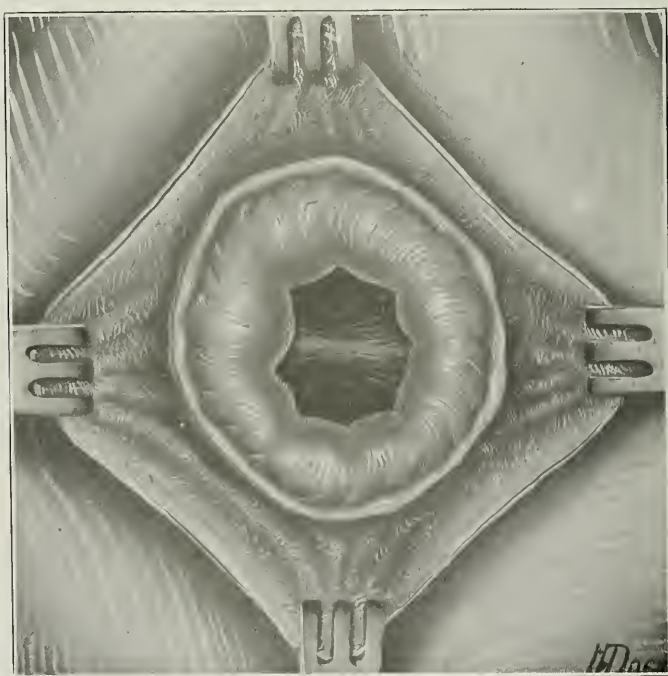


Fig. 327.—The artificial anus freed from surrounding tissues.

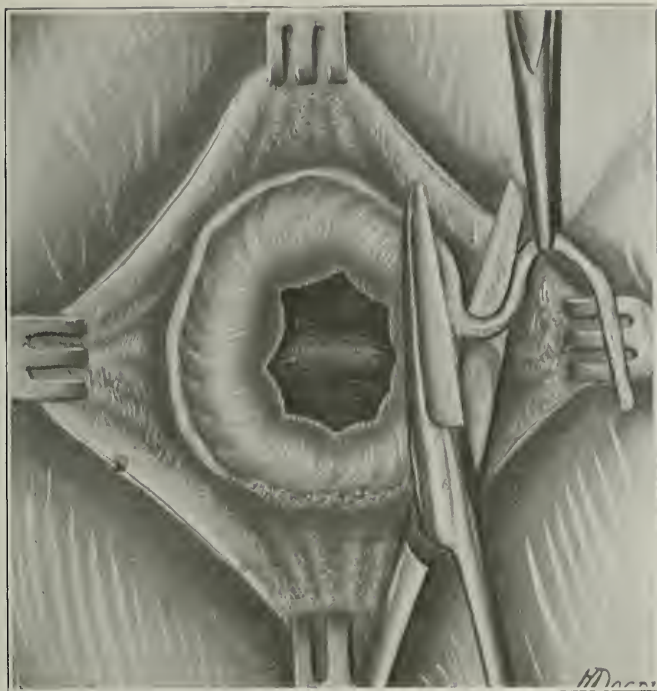


Fig. 328.—The connective tissue ring trimmed away.

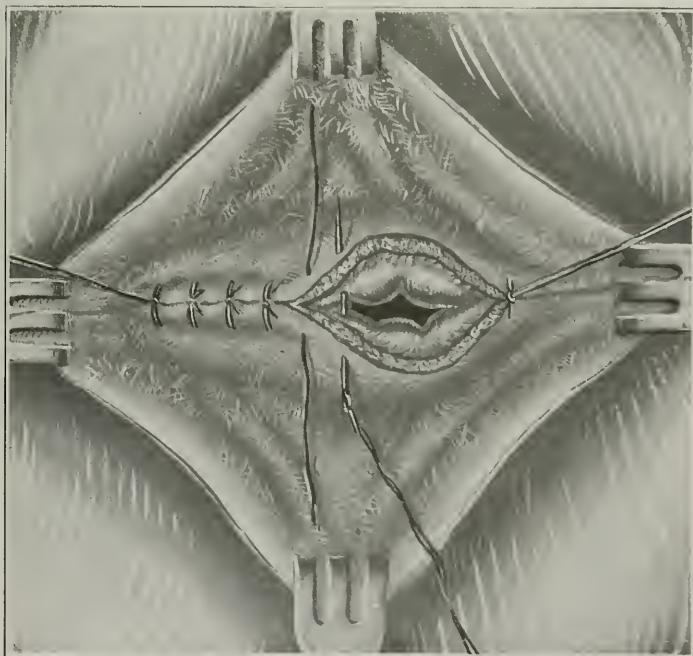


Fig. 329.—Transverse suture of submucosa.

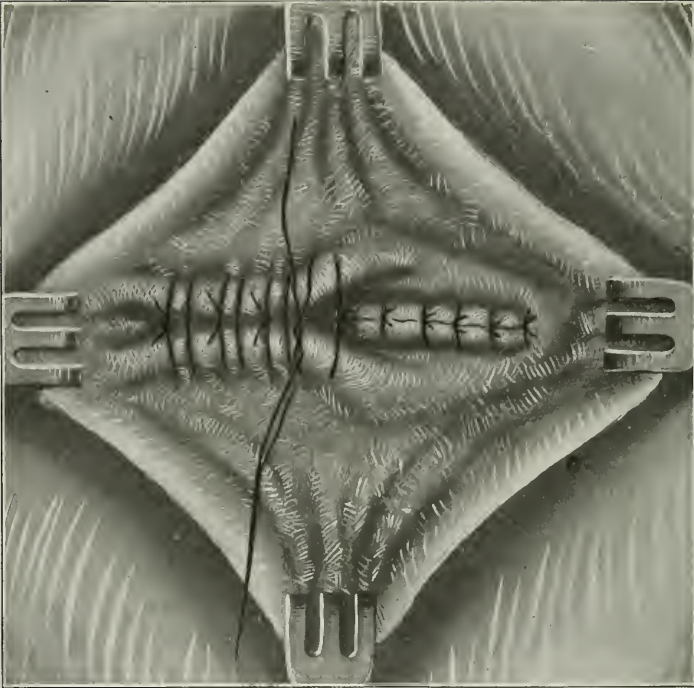


Fig. 330.—Transverse suture of intestinal wall after bowel edge has been inverted.

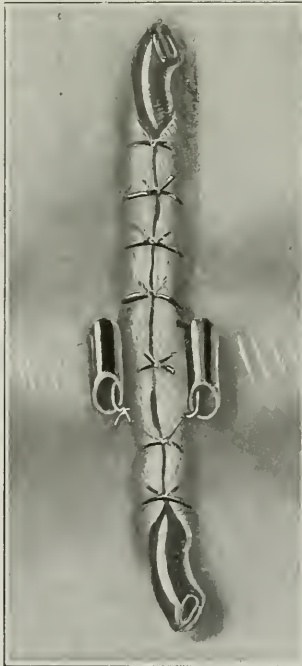


Fig. 331.—Longitudinal suture of skin with reinforcement and drainage.

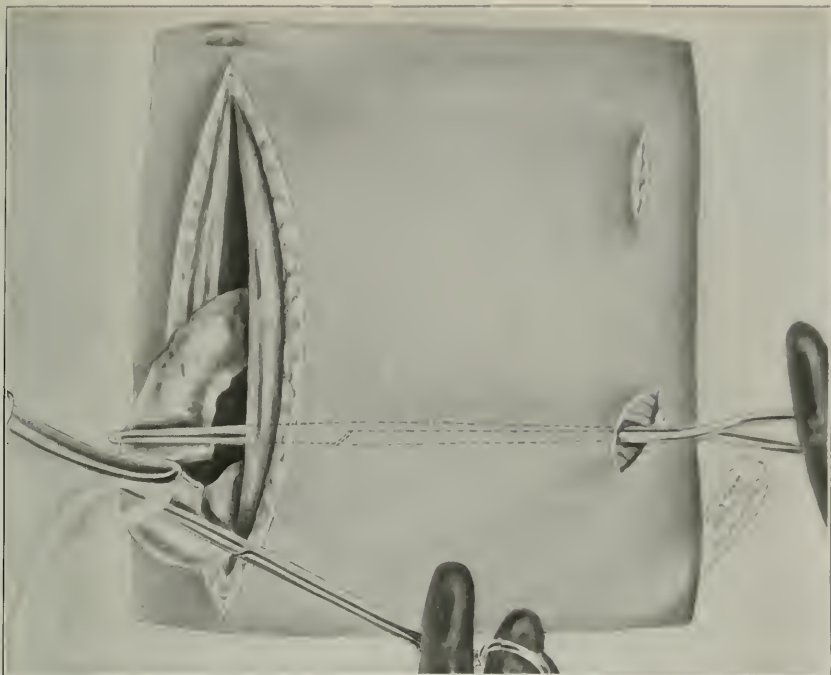


Fig. 332.—The sigmoid is divided with a cautery, a dressing forceps thrust into abdomen through an opening near the anterosuperior spine grasps the oral end of divided bowel.

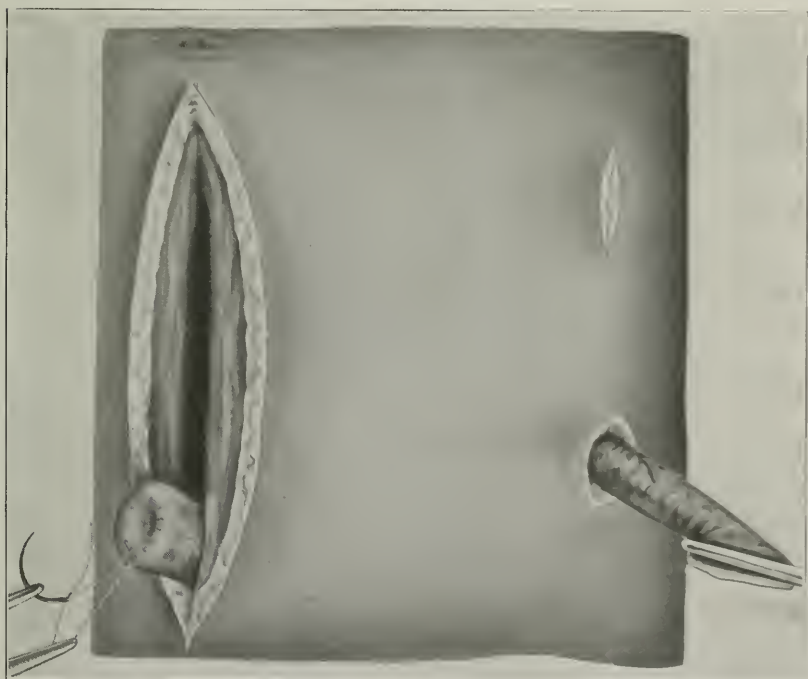


Fig. 333.—The anal end of the bowel is sutured blind and dropped back into the abdomen, while the mouth end is drawn out through the stab over left anterior superior spine.

The care and the cure of *accidental* and *drainage fistulæ* are considered in detail under the caption *Fistulæ*, and while they belong to intestinal surgery, still, for the sake of brevity, no repetition is indulged in here. One caution concerning drainage fistulæ must be emphasized here: never fail to open the intestine while the patient is on the operating table (Figs. 318 and 319). If the drainage is instituted at all, it is almost always an urgent matter, hence, it is wrong to wait for adhesions to form, as some have done. In addi-

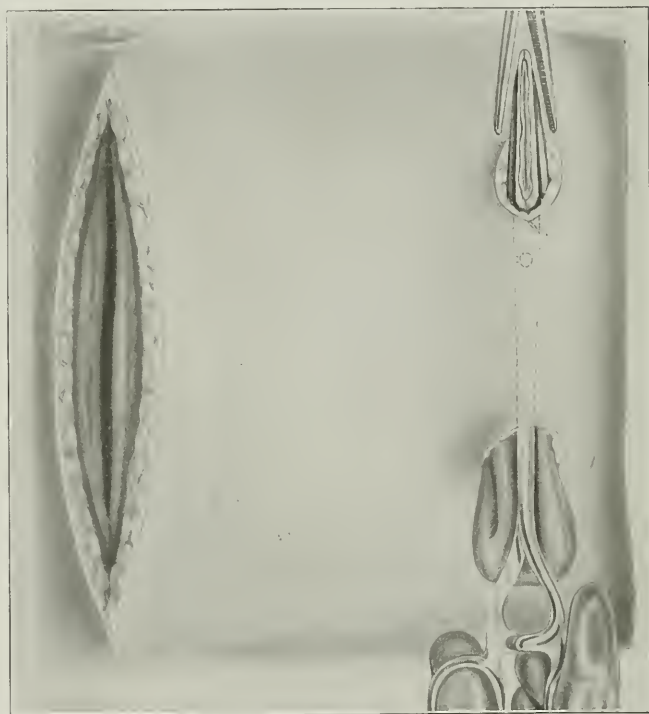


Fig. 334.—A second stab is made through the skin 8 cm. above the first and the oral free bowel end is pushed upward beneath the skin until it emerges from the second stab opening.

tion, it is very difficult to orient oneself as to the tissues at any period remote from the first step of a drainage operation. Then, too, the emptying of a paralyzed intestine is sometimes so difficult that a tube (Figs. 320-323) should always be securely fastened in the gut, at the time it is attached to the abdominal wall (Figs. 324 and 325) and thus, the gas tension liberated, while at the same time, the edges of the abdominal and intestinal wounds are held open by it. It is desirable that a patient with an overdistended intestine be turned on the face, so gravity drainage of the bowel will take

place, since every effort may be required to aid the very slight functioning ability which remains at the time drainage is instituted.

Exclusion of an intestinal segment would seem on first thought, to be, in theory at least, a simple matter of dealing with an area, which for some reason, we wish to dispense with, and do not dare to resect. It required, however, a vast amount of experience in this line to convince us that nothing short of *complete* exclusion fulfills all the requirements in any case. Suppose an *incomplete* exclusion of an intestinal coil be done by simply performing a lateral anastomosis.

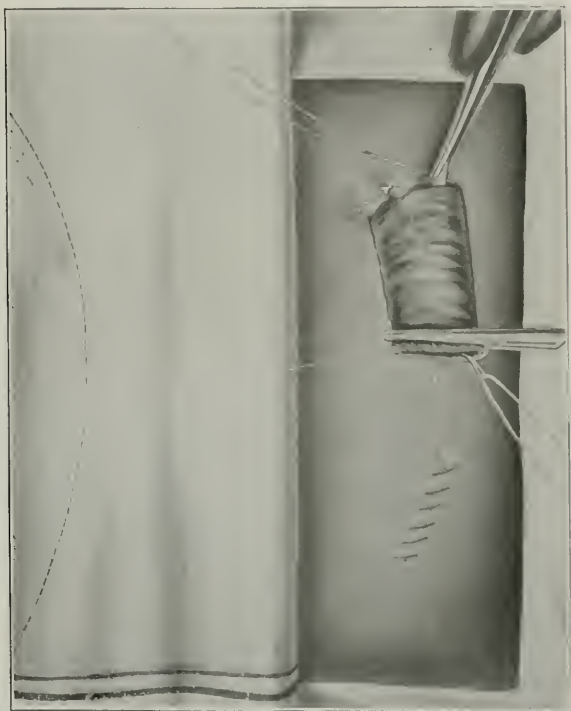


Fig. 335.—The first stab opening is sutured and the skin around the second one is united to the exterior of the bowel.

The intestine is by no means an inanimate elastic tube, but on the other hand, its functioning or peristaltic ability maintains its tendency to propel contents along the canal so that a lateral opening in it will not drain off much of this matter, unless there be an obstruction below the point of drainage.

It might be thought that an end-to-side anastomosis between the lower ileum and the sigmoid would be the functional equal of resection of the entire colon. In fact, this procedure was once sub-



Fig. 336.—A tube is tied in the bowel after which the laparotomy and first stab wounds are covered with collodion.



Fig. 337.—The wound dressings are perforated to permit the passage of the drainage tube. Control of bowel contents is secured by the patient wearing a pad pressing firmly upon the skin bridge between the first and second stab openings.

stituted for the Lane colectomy, until it was discovered that a retrograde peristalsis in the course of time, resulted in the filling up of the entire colon, with a permanent collection of feces, in consequence of the backward current which had been demonstrated in the colon prior to the advent of this operation, but apparently overlooked by those who performed it.

When a complete exclusion is made, that is, when the intestine is transversely divided at two points and the proximal bowel united to the distal, leaving, let us say, a certain segment with its mesentery attached and both ends closed blind, some communication with the exterior must be established in such an excluded segment, else there will accumulate mucus and desquamated epithelium to the extent of bursting, unless it be removed *in toto*. If, however, such colon be treated primarily by exclusion and drainage, it will, in the course of years, reach a stage of atrophy in which drainage is no longer required, and if the external communication does not close spontaneously, it may be sewed up with impunity and left in the abdomen.

Where the two stage resection of sigmoid is made, the resulting free ends of bowel unite with the skin to form an artificial anus which must be closed later. This can often be done without opening the peritoneum, as shown in Figs. 326 to 331 inclusive.

A permanent artificial anus is well made after high amputation of the rectum by the method detailed in Figs. 332-337 inclusive. It has given perfect control at my hands.

CHAPTER LXXI

THE LIVER

By Willard Bartlett, St. Louis, Mo.

Abscess.—Mr. James Cantlie, whose work has a special bearing upon the treatment of this lesion in the tropics where facilities and assistance are not always adequate, very warmly recommends the use of a heavy trocar and tube of rubber introduced through it in the treatment of this malady. No doubt this can be done either with or without a small incision in the abdominal wall, the plan being to explore first with a small needle, then upon finding the abscess, to plunge a heavy trocar and cannula into it, remove the trocar, slip a rubber tube down in its place, and then withdraw the cannula, being careful to leave the tube *in situ*.

The after-treatment under such circumstances must be a matter of the utmost simplicity and the results are said to be astonishing, still I shall not go further into detail because the procedure is not commonly employed in the temperate zone where facilities for surgical work are usually adequate. I approximated the simplicity of Mr. Cantlie's suggested method in one instance when I tapped a distended *gall bladder*, and thereby succeeded in draining a large solitary liver abscess which apparently had free communication with the large bile ducts in the liver, or just outside it. In this instance, the after-treatment consisted of continuous siphonage, which was produced by a fluid-filled tube, making a water-tight joint with the gall bladder, and kept under the surface of antiseptic fluid in a large bottle on the floor.

A great deal has been written about the *wound dressing* to be employed after treatment of a liver abscess. After a very considerable experience, I feel that the only proper way to treat such a wound is to *dispense* entirely with gauze, cotton or other absorbent materials. The patient is very much more comfortable in the absence of a moist, warm, irritating pus poultice; disagreeable odors are obviated, and the growth of putrefactive bacteria is surely not favored. My plan is to keep the bedclothes off the wound by the use of metal arches, while a roll of cotton or other absorbent material at the patient's side takes up the wound excretions as they run over the skin. It must be added that a few patients sleep better when

bed covers are in contact with the body, a simple matter of habit, one for such I am accustomed to apply a voluminous dressing for a few hours at night only, but I do not recommend even this if it can be avoided.

The position of the patient in bed is a matter of the greatest import, and is to be chosen according to the location of the incision. Without going into technical details, one may be pardoned for stating here that an accomplished surgeon will have so placed his incision as to attack the pathologic region by the most direct route. No matter then where the incision has been placed, the patient must assume such a posture for the greater part of the time, that the external drainage opening will represent the most dependent portion of the body. It has so happened that an anterior incision has been indicated in most of our own cases, hence, it has come about that the patients have been instructed, persuaded or coerced into lying upon the face a greater part of the time, and in instances where this was brought about, not an operation for solitary abscess has resulted in failure. A failure to appreciate this self-evident plan of drainage was afforded by a patient whom I saw very recently. He had been operated on some months earlier, but in spite of this he lay on his back with a rather small opening in the anterior upper abdominal wall, in which there presented one end of a gauze wick, the remainder of which dangled in an enormous pool of stinking pus. The patient's general condition was about what one might have expected as a result of such faulty mechanical practice.

The character of pus in these cases varies markedly in different individuals, as it does at different periods in the same patient. Early in the course of drainage, it is thick, flocculent and reddish in color, due no doubt to the fact that it contains a large amount of broken down liver tissue, whereas, later on it may assume the appearance and consistence of ordinary pus, and then, as the abscess cavity becomes obliterated, the discharge gradually takes on a more or less serous character.

One need not be surprised at any time to see *blood* appear in the exudate. Sometimes the quantity will be so great as to assume alarming proportions, and indeed, fatal hemorrhage has taken place by erosion of liver vessels or decubitus, due to the pressure of drainage material. This complication is to be met in the manner described in the chapter on hemorrhage, to say nothing of local gauze packing, provided this be possible through the drainage opening.

The appearance of the exudate is, in almost every instance, at some time or other, altered by the appearance of *bile*. This is, as a

rule, present in traces only and has no serious significance, still, instances are reported in which apparently a very large biliary radicle has been eroded, and all of the bile for a time has discharged itself into the wound, with resulting clay-colored stools, such as are seen when all of the bile is diverted as a result of surgical drainage of the gall bladder and hepatic biliary passages.

It is not uncommon during the active drainage period, to observe the escape of *necrotic liver masses* of various sizes. This is especially true if the abscess has not been originally of the solitary variety. In one sense, this phenomenon is of serious portent, indicating as it does, multiple cavities, but on the other hand it may, perhaps, at times portend a favorable outcome, if it be taken as an evidence that the partition walls are breaking down and numerous cavities are on the way to fuse into one single abscess space.

In order that certain mechanical details of after-treatment may be understood, I must needs mention that in operating upon these individuals through an anterior abdominal incision, I locate the region of the abscess, then pack gauze between the abdominal wall and the liver, leaving the bulging area exposed, and catch with clamps this protruding shell. After the abscess cavity has been opened with the canter, a heavy split rubber tube is inserted and the clamps are left on, thus firmly anchoring the liver surface against the gauze and abdominal wall. The weight of the clamps protects the viscus against separation from the abdominal wall by reason of the respiration and other movements. They are, as a matter of course, left in place for several days, or until one is sure of fairly firm adhesions between the opposing peritoneal surfaces.

The gauze is removed at the end of one week, by which time it will be exceedingly foul, but so loose that no effort on the part of the dresser, or distress on the part of the patient, attends its extraction. Here, as everywhere else that gauze packs are used, we remove them either at the end of forty-eight hours before granulations have grown into the meshes, or else at the expiration of a week when supuration will have rendered the foreign body exceedingly loose.

The time for the removal of drainage tubes will be found to vary with the size of the cavity and the recuperative powers of the patient. It is my custom to cut off these useful objects as fast as they are pushed to the surface by the decreasing size of the cavity. It is a mistake to take out the last remnant as long as there is any considerable dead space, since too early closure of the orifice may take place, with consequent reaccumulation. The patient usually wears a tube for several weeks and there seems to be no harm in

so doing, provided merely that a decubitus does not result from a pressure of its squared-off inner end.

The prognosis varies as it does in all pathologic conditions to a certain extent, with the degree of the patient's resistance. However, here one special consideration must always govern the outlook: viz., solitary abscesses usually heal completely, while patients with multiple abscesses die, as a general rule. I remember one striking exception to this rule. The patient was a young boy, whom we treated at the St. Louis City Hospital several years ago. The walls between his multiple abscesses were broken down as far as found by the explorer's finger, and tubes were inserted in different directions. For a long time he remained exceedingly ill, but ultimately, to the surprise of everyone, he recovered. However, one is, speaking in general, to offer very little hope when confronted with such a case.

General septic infection which was fully covered in another chapter, occasionally leads to a fatal termination, even where the abscess is solitary. This is, on the other hand, a very frequent outcome where the abscesses are multiple, and unfortunately, little besides the ordinary hygienic and reconstructive measures can be undertaken to ward off a fatal issue.

One of the important complications attending the treatment of a solitary abscess is *recurrence* after the lesion has been drained once. This, where it occurs, will usually be due either to the fact that the wound was drained for too short a time, or that an unfit location was chosen for the opening. I remember in particular one instance in which the tender eminence was upward and to the right. A resection of the ribs and transpleural drainage very easily disposed of the morbid condition, even though the patient had been subjected to an operation several weeks previously. In the earlier attempts the surgeon had chosen the anterior abdominal wall, even though this was far from what one would consider the point selected as indicating the most direct approach to the abscess cavity. A very long drainage tract had been produced, the same having collapsed and healed promptly as soon as the tube was removed.

The reconstruction of one of these patients is a matter of importance, and is rapidly accomplished by the use of food, rest, mental quietude and a life in the open air. I make it a rule to remove the patient's bed to a sheltered porch, no matter what the time of year, provided, of course, that we can first gain the patient's confidence, to make him feel that he is not being unduly exposed in

this manner. It is surprising to note the improvement in a septic case as soon as it is brought permanently out of doors.

I know of no other condition in which the contrast between disease and health is more striking than that which one notes in abscess of the liver. I recollect one boy who was brought to the hospital after suffering, as had been supposed, for many months with typhoid fever. He was an emaciated wreck with enormous upper abdomen, who a few months after drainage had been instituted, became a perfect physical type.

Since so many liver abscesses are supposed to be of amebic origin, it stands to reason that the treatment of dysentery where it exists in such cases, is certain to be a matter of interest to the surgeon, to say nothing of its importance to the patient. Those who have used emetin so enthusiastically in the past, will no doubt be vitally interested by an editorial which appeared in the *Journal of the American Medical Association*, May 25, 1918. A part of it is produced verbatim:

"Dale and Dobell of the Medical Research Committee in London have lately made a somewhat rigorous test of the action of substances that already have gained or are likely to gain a therapeutic reputation in amebic dysentery. These studies have brought evidence of an unmistakable discrepancy between the action of emetin, in particular, and likewise other substances in vitro and their curative effects in dysentery. The earlier assumption on which the use of ipecac alkaloids was based attributed their favorable effect to a direct amebicidal action. Dale and Dobell found that emetin and the other alkaloids of ipecacuanha, as well as artificial derivatives, exhibited no characteristically high toxicity for the amebas, when compared with that of some other alkaloids. Methylopsychotrin, a natural alkaloid from ipecacuanha, which is more toxic for *Endameba histolytica* when tested in vitro, and much less toxic for mammals than emetin, appears to be entirely devoid of therapeutic action even when it is given in large doses.

"There is clearly some other factor, Dale and Dobell conclude, in the cure of dysentery by emetin, than the alkaloid and the amebas; and that factor must be supplied by the host. The participation of the host in the process is believed to be further evidenced by their observation that emetin has no appreciable effect on the course of amebic dysentery in the cat, while it cures the disease in man, even when the same strain of amebas is present in the two hosts. It should be remembered that the *Endameba histolytica* is an

obligate parasite which, unlike some other amebas that survive in the contents of the bowel, can live and multiply only by invading the tissues of its host. Perhaps, therefore, the effective drugs act by promoting some natural defensive reaction to invasion. In any event the theory of the mode of action of emetin in amebic dysentery needs reconsideration; and on its correct formulation rests in no small measure the possibility of selecting other suitable amebicides."

CHAPTER LXXII

THE GALL BLADDER AND DUCTS

By Willard Bartlett, St. Louis, Mo.

Let us suppose that the *gall bladder has been left in and drained*. Perhaps the chief consideration in the after-treatment will now be bile drainage. This will surely be true if the surgeon has elected to leave the bladder behind, because of acute inflammatory changes in the bladder and ducts, or because of bile obstruction, which it was thought best not to attempt to relieve by direct incision of the common or hepatic ducts. An observer might conclude that the gall bladder no longer has any connection with the rest of the biliary apparatus, because on the operating table bile does not flow into it after stones and detritus have been removed. Such a deduction is, however, unwarranted in view of the fact that we have occasionally seen bile make its appearance only at the expiration of a week or ten days and then flow copiously, owing no doubt, to the disappearance of edema in the walls of the cystic duct.

No doubt, many a case of cholecystitis is cured by the removal of *all* the stones and by temporary drainage of the gall bladder, a matter which is perhaps better described in detail in works on operative technic, which take up the relative merits of drainage versus removal of the gall bladder.

A new utilization of the gall bladder drainage tube was instituted a few years since by McArthur of Chicago, when he employed it for the introduction of salt solution into the intestinal tract. He was the first to show us that any desired amount of fluid can thus be easily and conveniently introduced, that in consequence, the patient's kidneys are rapidly flushed out and a sick individual is frequently improved to a surprising degree in a short time. Matas went further than McArthur and introduced fluid nourishment through the tube, with the utmost satisfaction. These two procedures are to be heartily recommended, and in my opinion, constitute two of the very best recent improvements in the technic, so far as the biliary apparatus is concerned.

No very definite rule, covering all cases, can be given for the period that drainage should be continued. No doubt, a highly toxic patient should be drained (Figs. 338-344) longer than one

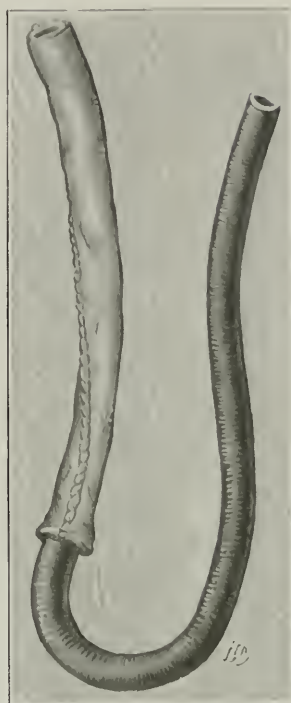


Fig. 338.—Gall bladder drain tube, made by winding rubber-dam about an ordinary rubber tube and sewing down the free edge.

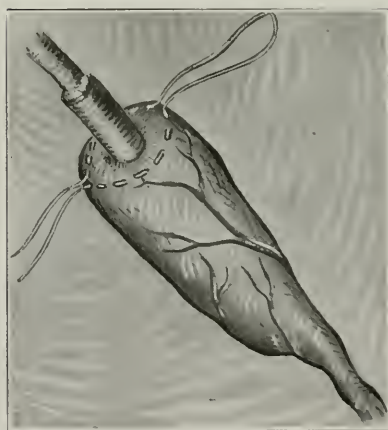


Fig. 339.—Self-inverting suture introduced into the gall bladder. (After Keen.)

who is operated on in the interim. We may state with safety that a robust individual may lose bodily fluids with impunity for a longer time than is to be recommended for a less favored patient. It is my own custom to remove the tube at the end of a week or so, when the catgut purse string suture lets go. I have, however, in exceptional

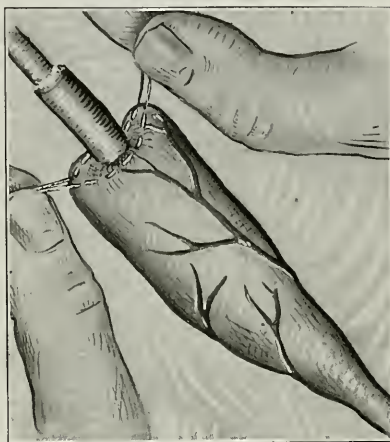


Fig. 340.—The tube pushed down while circular suture is held up. (After Keen.)

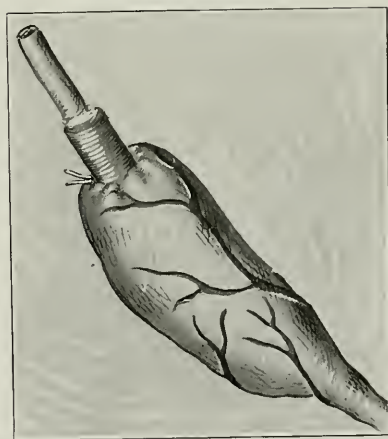


Fig. 341 —Circular suture tied. (After Keen.)

instances, left it in place for a much longer time. In one case, where there was a stone in the common duct, the tube remained in place about a year, or until the edema in the duct wall around the stone so completely subsided that the latter slipped down into the intestine, and the patient was spontaneously cured.

A *biliary fistula* sometimes persists for a considerable period, even though there be no mechanical obstruction in the course of the common duct. Usually this can be successfully treated in a very short time by an application of the physiologic principle that bile is, under normal circumstances, intermittently discharged into the duodenum as food passes along it. Every one who has observed drained cases knows that the discharge of bile is more annoying at night

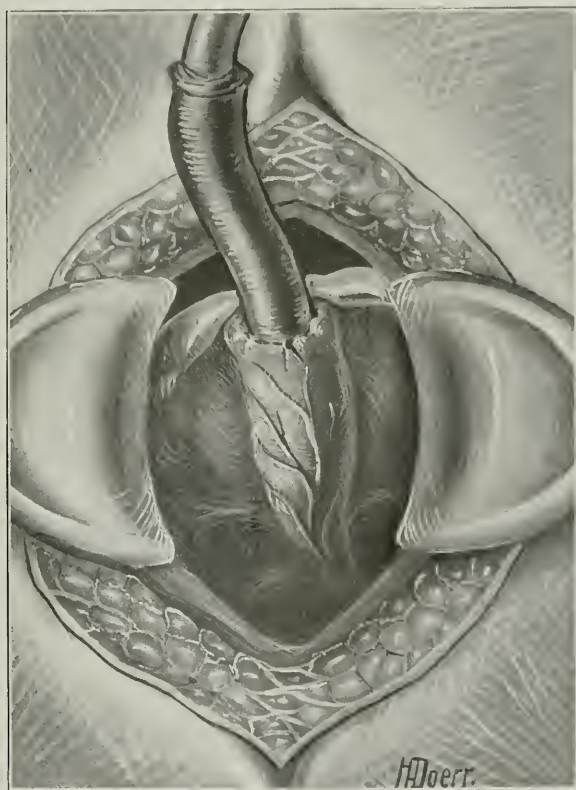


Fig. 342.—Appearance of gall bladder and drain just before closing the abdomen.

than in the day time, for the simple reason that the individual is fed at intervals during the latter period, and hence, the major portion of the bile finds its way into the bowel. In view of these facts, it is a matter of very simple deduction which leads us to awaken such a patient every three hours during the night for the ingestion of food. The surgeon who has had difficulty of this kind, will be very happily surprised by the result attained by this easy variation of our normal routine, and will, at the same time, be able to con-

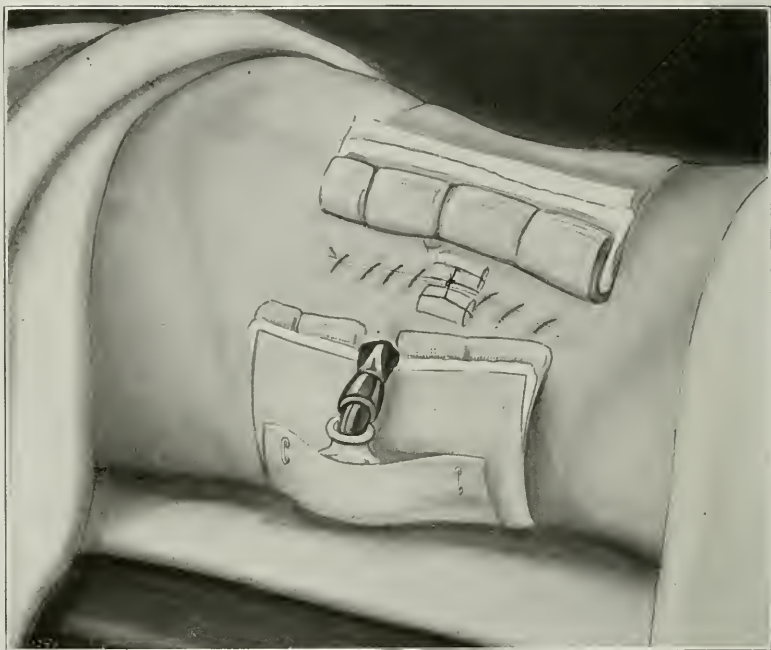


Fig. 343.—The drain may be brought out through a supplementary stab and carried into the bottle.

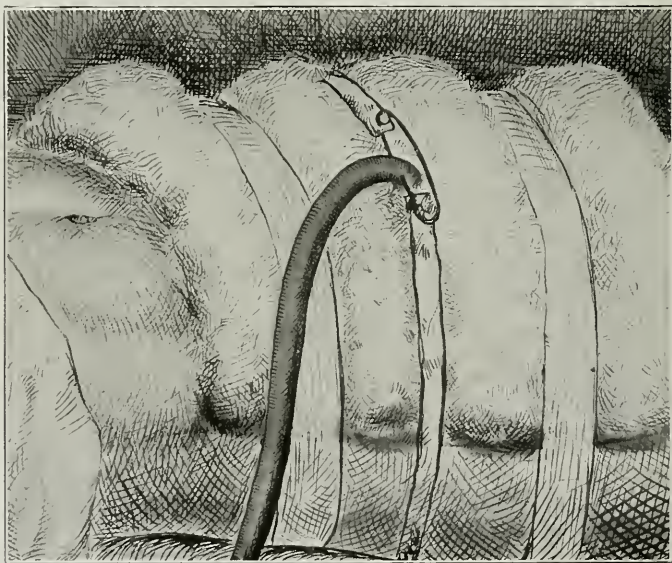


Fig. 344.—Tube anchored by safety pin to adhesive straps.

vince himself of the presence or absence of mechanical obstruction low down in the bile passages.

The persisting *mucous fistula*, after gall bladder drainage, is quite another matter. This indicates interruption in the continuity of the cystic duct, and is attended with further reaching consequences



Fig. 345.—The gall bladder has been shelled out of Glisson's capsule and the cystic duct is being divided. (After Judd.)

than is true of the anomaly described in the preceding paragraph. A mucous fistula necessitates the permanent wearing of a small tube, since the spontaneous closure of it means inevitable symptoms of retention, with consequent surgical intervention or spontaneous external drainage.

Secondary removal of the gall bladder after drainage is of not uncommon occurrence, and there are many reasons why this should be so. One has but to consider the fact that highly diseased bladders must be drained in what may oftentimes amount to an emergency, and it stands to reason that a highly diseased viscus, although the stones have been removed, may continue to give symptoms



Fig. 346.—A strip of folded rubber for drainage.

which in time lead the patient to have it taken out. As a matter of course, a mucous fistula can be permanently disposed of only by the removal of the offending bladder. A detailed consideration of this phase of the subject would lead us so far afield that it is probably better dismissed with the single reflection that the surgeon who drains the gall bladder can never be sure that it will not ultimately have to be taken out.

Let us presume that the *gall bladder has been removed* (Figs. 345-349). Then there arise postoperative considerations which differ somewhat from those which have just been discussed. Bile drainage in these cases may be considered rather unusual. In fact, many capable operators go so far as to ligate the cystic duct stump, in what is considered a permanent manner, and then completely close the abdominal wall. It is my own invariable custom, however, to tie a strip of folded rubber to the stump, so that the bile may follow it to the surface, if need arises, after the catgut ligature is

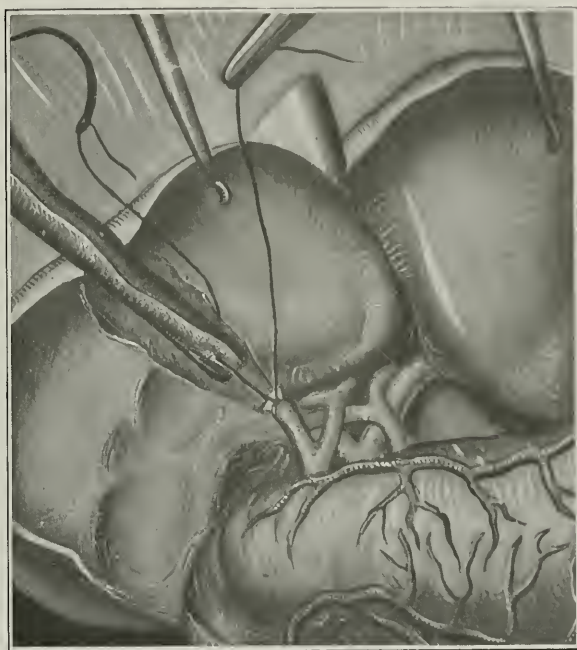


Fig. 347.—Folded drain tied to cystic duct ligature with catgut.

absorbed or cuts through. When such drainage does occur, it is usually of very short duration and subsides promptly when the walls of the long drainage tract collapse and obliterate it. Perhaps the most immediate need in the after-treatment here is gastric lavage. Paresis of the stomach, with acute dilatation is rather to be expected in just these cases, because there is always handling of the upper duodenum and pyloric region, with sometimes very extensive denudation, and unless the operator is particularly skillful at peritoneal-plasty, there are sure to be many adhesions, frequently of a permanent nature.

In rare instances clamps (Fig. 350) have to be left in place after a removal of the gall bladder, because it seems difficult or unduly time-consuming to ligate the cystic duct or the cystic artery. I have had to do this, but can not recommend the procedure and do not indulge in it unless it seems unavoidable. The presence of clamps in a deep wound just under the liver, is always a source of annoyance to the patient, and in consequence of the offending for-

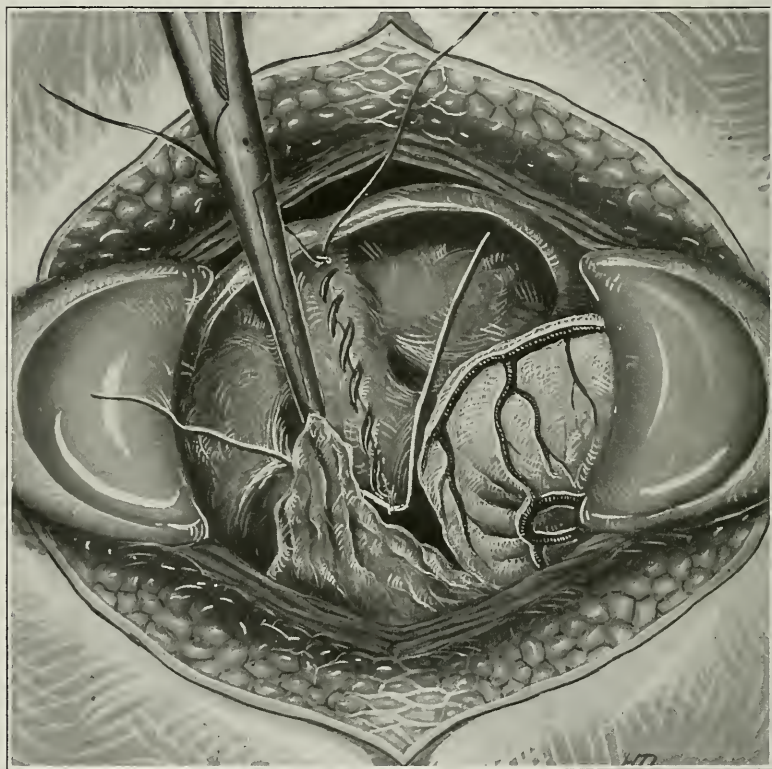


Fig. 348.—Glisson's capsule is sutured obliterating the defect, and omentum attached to it to prevent pyloric adhesions.

ceps in the body, the free excursions of the diaphragm on the right side are limited, and as result of this, ventilation of the lower right lung is interfered with. There has been in my experience, a distinctly higher incidence of lower right-sided pneumonia where clamps were left in position than has been observed elsewhere in my gallstone work. I consider this practice so prejudicial to the patient's welfare, that the clamps when rarely so employed are removed rather earlier than seems common in the practice as ob-

served by us in the past. The instruments are unlocked at the end of twenty-four, or at the latest, thirty-six hours, and slipped out six hours later. In no case has immediate hemorrhage supervened. Very adequate bile drainage may be secured in this way, a matter which is considered of importance, under exceptional circumstances by so eminent an authority as Dr. Wm. J. Mayo.

One of the most tragic consequences to be imagined after the removal of the gall bladder, is the occurrence of a *duodenal fistula*.

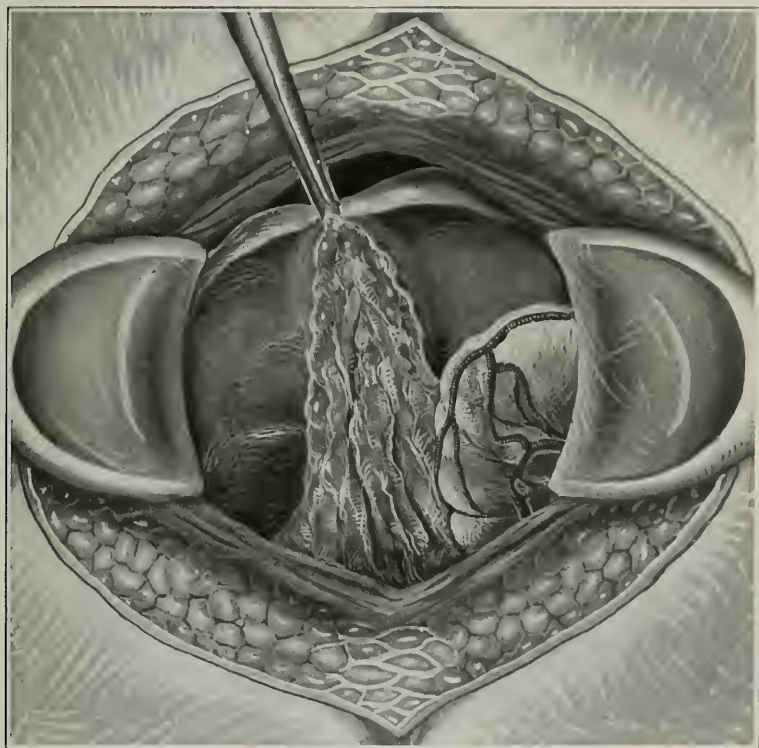


Fig. 349.—Omentum interposed between suture line of Glisson's capsule and the pyloric region.

Not infrequently, adhesions or even a fistulous communication between the gall bladder and duodenum, are encountered, with resulting injury to the latter when the former is taken out. As a matter of course, the repair of a deep-seated defect is difficult and frequently unsatisfactory, especially so in the presence of acute or subacute inflammatory infiltration of the bowel wall. On one occasion I went so far as to obliterate the pylorus and do a gastro-enterostomy, in the endeavor to protect a weak spot of this kind in

the wall of the duodenum. Many an operator has been bitterly disappointed a few days after a painstaking effort at repair in this region, to find the patient's stomach contents issuing from the drain opening in the abdominal wall. The prognosis under such circumstances is exceedingly grave, and unfortunately, there is not much

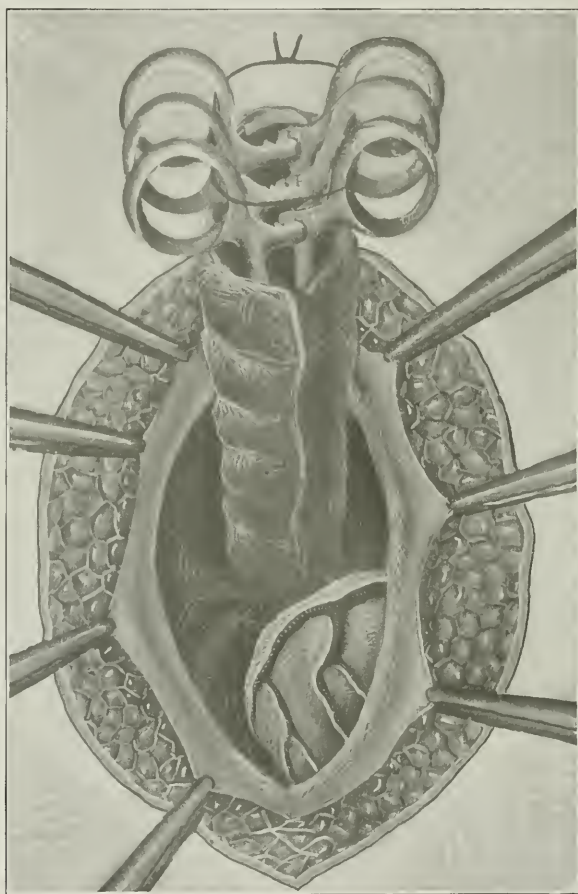


Fig. 350.—Clamps left on the stump of the gall bladder carefully wrapped in rubber to prevent contact with the viscera.

to do, except, perhaps, if the patient's condition warrants, to open the abdomen on the opposite side and institute jejunal feeding.

A rare complication of gall bladder removal is infection of the region immediately contiguous to the stump of the cystic duct, which has not been drained through the abdominal wall. Very rarely a chronic inflammatory focus is established here, with the

result that the patient does not recover completely until a reoperation months or years later, when removal of the inflammatory products is done and drainage established.

Operations on the *bile ducts* are attended with certain complications and involve certain methods of after-treatment which justify a special consideration of this division of the subject.

The use of drainage is here the matter of immediate extreme urgency. The surgeon will, in many instances, provide for this through an opening in the common or the hepatic duct (Figs. 351 and 352), although it must be admitted that Halsted's contention in favor of primary suture of these ducts after a removal of an ob-



Fig. 351.—A common catheter to be used as hepatic duct drain. (After Keen.)

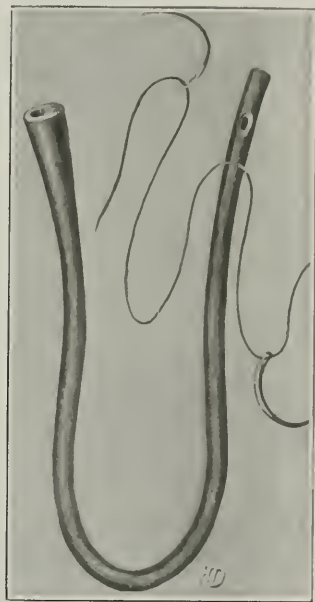


Fig. 352.—Tip of catheter cut off, and suture inserted for anchoring it to the hepatic duct. (After Keen.)

struction, can not be idly passed over. Let us suppose that the operator has left a rubber tube in the common bile duct. The fluid which escapes may bear no superficial resemblance to bile, being rather serous in character. This, according to Wm. J. Mayo, who has done more of this operating than any other single individual living, is of most serious import, since it indicates that the bile producing functions of the liver had been interrupted previous to the operation. Dr. Mayo states that he has, however, on rare occasions, seen bile coloring material appear in the drainage fluid, subsequent

to the operation, hence, one can not unreservedly give a bad prognosis under such circumstances.

The *protection of the skin* becomes an important matter, because of the fact that common duct drainage often involves a discharge of enough pancreatic fluid to prove disastrous, so far as local digestion about the wound is concerned. I employ no form of dressing under such circumstances, believing that a poultice of the character formed by gauze and cotton soaked in bile and pancreatic juice furnishes, when warm, the very best possible conditions under which skin digestion can progress. I prefer rather, to leave the wound wide open, the patient being protected from the bedclothes by a metal arch, the skin, in the meanwhile, being kept dry, except at the point where fluid pours over it. The rest of the region about the wound is kept smeared with zinc oxide paste, and by changing the patient's position frequently, a rather restricted skin segment is exposed to the action of the fluid at a time, allowing the rest to dry and then be smeared with the oily paste at frequent intervals.

It is probable that common or hepatic duct drainage, which diverts all of the bile stream, should be of shorter duration than should gall bladder drainage, which is usually only partial. Our practice is to tie a tube in place with fine catgut, which is absorbed in a few days, provided the lower bile tracts are known to be free. This is allowed to come out as soon as the catgut melts. There seems to be a distinct menace in the too long continued removal of a large amount of body fluid in this way, to say nothing of the fact that we are here concerned with bile and pancreatic juice, fluids which can not be considered indifferently, from the physiologic point of view.

As mentioned above Dr. Matas has gone further than Dr. McArthur in the instillation of fluids directly into the intestine by way of the bile passages. In an article published in the *New York Medical Journal*, January 27, 1912, Dr. McArthur writes as follows: "If to a tube draining the gall bladder in an ordinary case of cholecystostomy, we connect the tube of an irrigator, containing, for example, sterile, warm, normal salt solution, the rate of flow being graduated so as not to exceed five or six drops a second, and the pressure to be no more than twenty inches elevation, a continuous flow into the duodenum can be established and maintained without discomfort to the patient. At that time I had refrained from using the irrigation through the tubes introduced for drainage of the common duct until the second or third day, i.e., till well walled off from the general abdominal

cavity (for fear of leakage). Here is where Matas has shown us an improved technic, as well as how safe and efficient is the introduction at the time of operation of a small rubber catheter (a demeure) into the duodenum by way of the common duct, letting it project there from one-third to one-half its length. Through this, with absolute confidence of its arriving safely within the duodenum, he could introduce any desired amount of any given fluid, food, or medicament indicated. In fact he has in this manner, for

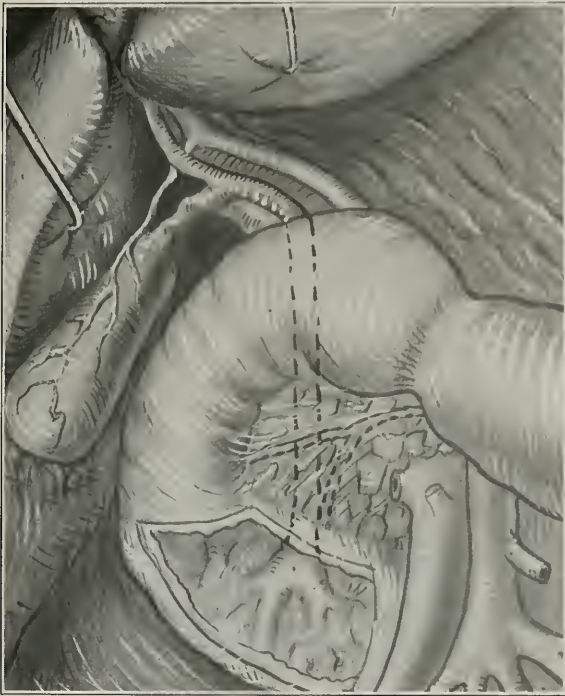


Fig. 353.—Showing diversion of bile when the gall bladder is anastomosed with intestine.
(After Keen.)

a period of three weeks, given diuretin, panopepton, strychnine, castor oil, Carlsbad, Hunyadi water in purgative doses to the great satisfaction of the patient, and with no untoward results because of its method of introduction."

Dr. McArthur told me in a conversation (October, 1917) of a still further refinement which he had introduced along this line, intended to drain the hepatic region when desired, and still, not continuously lose the physiologic activity of the fluids under consideration. He places two tubes in the common bile duct, one directly

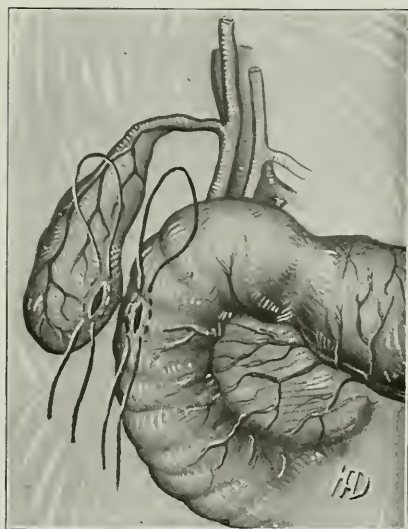


Fig. 354.—Purse string inserted in gall bladder and another in the intestine. (After Keen.)

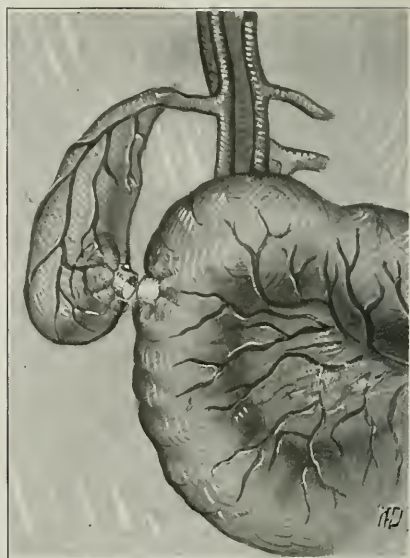


Fig. 355.—Half of Murphy button in each viscus. (After Keen.)

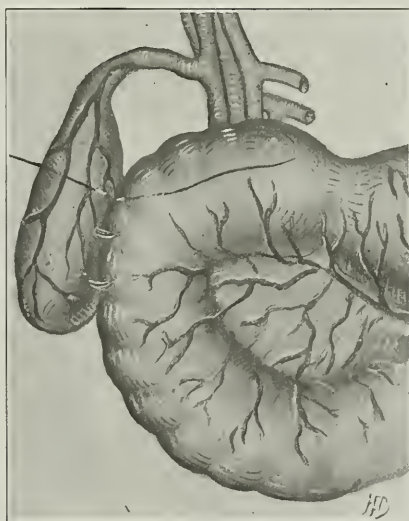


Fig. 356.—Anastomosis complete after halves of button have been pressed together.

up into the hepatic duct, and the other down to the duodenum. If the patient shows symptoms of exhaustion from too prolonged bile drainage, he simply connects the two tubes by a glass ferrule, and thus conducts the bile down into the lower common duct and duodenum where it belongs.

Stricture of the common duct occasionally follows the removal of a stone which has caused a decubitus of the walls about it, or the shrinkage of a too extensive surgical defect. This latter possibility is, according to Kehr, not to be taken too seriously, since, as he says, almost complete transverse division of the duct is by no means certain to be followed by fistula or obstruction. He considers that the duct possesses a very pronounced tendency to spontaneous reunion, even if a single shred of its mucous membrane be left intact. However, one is never justified in doing more than making a longitudinal incision into this tube, a performance which is followed, in the hands of most surgeons, by some effort at a partial repair of any defect not filled by the drainage tube. Numerous efforts to overcome the obstruction due to obliteration of the common duct have been made. The best one of them, no doubt, consists in establishing an anastomosis between the gall bladder and some convenient portion of the gastroenteric tract (Figs. 353-356). This will, of course, be more readily possible where the obstruction has been produced by a noninflammatory cause, since under such circumstances, the gall bladder is dilated, whereas, in 75 per cent of inflammatory obstruction, (gallstone disease) it is thickened and greatly shrunken.

Reconstruction of the common bile duct, where its continuity has been lost, is a matter of the utmost surgical difficulty. W. J. Mayo and a few others have succeeded in implanting the upper portion of the common duct, or the lower portion of the hepatic duct, end to side, into the duodenal wall. This must, however, be a matter of such technical difficulty as to be employed successfully by none other than the most expert operator. A number of attempts to re-establish the bile flow into the bowel seem to have succeeded where a rubber catheter was used to connect the hepatic duct with the duodenum, after which, the exposed portion of the catheter was covered by any structure which presented itself and was sufficiently easily mobilized to permit of its use; the idea embodied being that epithelium from the two structures thus anastomosed creeps out along the rubber and eventually lines the canal of scar tissue which is formed about the foreign body. X-ray indicates that all such extraneous substances are eventually thrown off into the intestines and passed out. I approached this subject with an open mind, since it is a matter which is too recent to warrant the expression of any opinion regarding ultimate results.

So much for the postoperative considerations as they affect the individual components of the biliary apparatus. There are a number

of complications which may affect one or all of these structures at the same time, so to avoid repetition they will now be considered without special application.

Hemorrhage in connection with operations on the biliary passages is a matter of such special import that although mention has been made of it in the chapter devoted to hemorrhage, still it can not be omitted here if full justice is to be done to the subject. As is very well known, a cholemic individual possesses a greatly exaggerated tendency to bleed. The clotting time will often be found abnormally long, and in fact, an acquired hemophilia may be said with propriety, to exist as long as such patients present the gross evidences of jaundice. Many a life has been sacrificed in this way, when a blood transfusion would have very promptly controlled the situation, as I have frequently seen in my own practice. It may then be said that the after-treatment, so far as jaundice is concerned, begins before the operation by the securing of a donor and the matching of bloods. This precaution should never be omitted, and indeed, so impressed am I by its value, that I mean never to undertake another operation on a jaundiced individual, circumstances permitting, without first being certain that a transfusion can be done any time after the operation on a moment's notice.

Postoperative hernia is not very frequently observed after operations on the biliary apparatus, due to the fact that a muscle splitting incision high in the abdominal wall is used. However, we have, in a few instances, encountered this accident where the operator seemed to have indulged in transverse or oblique division of all the muscle fibers entering into the formation of the right upper abdominal wall. On account of such a lesion being in close proximity to the rigid chest wall, the treatment of it presents difficulties of a most embarrassing nature. I feel, however, in this day of fascial transplantation, that the malady can be very much more satisfactorily overcome than has been the common experience in the past. Reference is made here to the special chapter on Postoperative Incisional Hernia.

The *recurrence* of symptoms after an operation for gallstone disease must be a matter of concern to any one who does a large amount of work of this kind. No doubt, many observers have been impressed with the fact that we could hardly expect uniformly good results in any part of the body, if the work were not more thoroughly and better done than we have all seen at times, when stones and other inflammatory products were removed from the region under contemplation. I believe that a recurrence of symptoms oc-

ens in most instances because the original operator has not thought of the common duct as being very frequently involved in patients who come to the table. Perhaps the cause second in importance is the incomplete removal of stones from the gall bladder or from the ducts, in instances where they are opened and explored. Surely we may encounter a third possibility, in the fact that a thick, diseased gall bladder from which all stones have been removed, has either rightly or wrongly been left behind at the first operation, and acted as a local irritant until its removal at a second sitting. The surgeon is, of course, not always to blame for the recurrence of symptoms, since in very many instances the indication for removal is not easy to establish; when we take into consideration the infinite variety of pathologic anatomy here observed, it becomes apparent that no mean degree of operative skill and experience may be demanded if the treatment is to be productive of ultimate satisfaction. Dr. E. S. Judd (*Annals of Surgery*, 1918) bases his conclusions as to recurrence on a review of 2027 operations, and since they have a distinct bearing upon this condition, are given verbatim:

“1. Removal of the gall bladder reduces the risk of later troubles, and ordinarily is to be preferred to cholecystostomy for drainage.

“2. It is not necessary to open and probe the common duct at every gall bladder operation.

“3. Infection in the liver, gall bladder, or ducts is the most frequent cause of secondary trouble, and may recur many years after the primary operation.

“4. The recurrence of stones is more frequent in the gall bladder than in any other part of the biliary tract. The common duct is next in point of frequency.

“5. In a definite small percentage of cases stones will be overlooked in the common duct; in other cases the stones re-form in the duct.”

Dr. Stuart McGuire presents these instructions to every patient leaving the hospital, following a gall bladder operation:

Your wound has healed, but you are not yet well. You are permitted to leave the hospital, but you must be prudent and continue treatment after you get home.

It is impossible to give you directions as to the tonics, laxatives and other medicines you may need as your condition will vary from time to time. It will, therefore, be necessary for you on your return home to place your case in the hands of your family doctor. He has been written to and told what has been done to you and what was learned about you while you were at the hospital. Seek his advice when perplexed and follow the directions he will give you.

There are some general rules which should be followed by all patients who have been operated on for your trouble. These have been written out for the convenience of both your doctor and yourself.

It is not necessary for you to wear any binder, belt or special corset. You may safely take tub baths. It is important to keep your mouth in good condition. Use a toothbrush and an antiseptic mouth wash both night and morning.

For a time you should carefully regulate your diet. Avoid raw or cooked fruit; all fats and greasy fried food; all pickles, condiments, and highly seasoned foods; all rich heavy sweets. Avoid alcohol; if taken at all, light wines are preferable to beer or liquors.

Your diet should consist principally of eggs, fish, chicken, moderate amount of red meat, well cooked vegetables, milk, buttermilk, cereals, toast and bread.

If tea and coffee are used it should be in moderation. Drink water freely, taking it preferably before breakfast, between meals and at bed time.

Exercise regularly and as far as possible in the open air. Begin with a short walk, the distance of three or four city blocks, and increase the distance each day as you gain strength until you walk several miles.

The bowels should be regulated as far as possible by natural means such as water, food, exercise and the establishment of a regular hour of going to stool. Mild laxatives should be used when necessary.

You may occasionally feel "bilious," have spells of indigestion or attacks of colicky pain in the upper abdomen. This is not likely due to a stone being reformed, or overlooked at operation, but to the fact that the inflammation of the gall bladder or ducts has not yet subsided. Should you have the symptoms described, try to empty the stomach by drinking and ejecting warm water and the bowels by taking a soap-suds enema. Eat little or no food, but live on milk and lime water until you can consult your doctor.

Under proper treatment and in a reasonable time you should get completely and permanently well.

At your operation the appendix was

Please report your condition by mail at the end of three months. If you are well, the information will help us. If you are not well, we may be able to help you.

CHAPTER LXXIII

APPENDICITIS

By Willard Bartlett, St. Louis, Mo.

The *chronic* type of the disease, with "interval operation," entails nothing especial in the way of after-treatment, hence, is dismissed with a word.

The *acute* form of appendicitis must be divided, with regard to complications and after-care, into the early and the late cases. I know of no field in surgery in which the after-care is simpler, and the results more certain than those following a timely operation in this otherwise dangerous malady.

The *early* cases may be divided into those which are clean and those in which pus is encountered. It will be assumed that a small McBurney gridiron incision has been made, provided, of course, that the diagnosis was relatively satisfactory and that the appendix was removed. One scarcely needs to consider at all the patients in whom no peritonitis is present at operation since they are tightly sewed up, and after a brief stay in bed, usually about three days in my hands, they are allowed to get up and to leave the hospital on the fourth day. In view of what Chlumsky has taught us about intestinal repair, these patients are not given cathartics or solid foods until an entire week has elapsed.

The experiments referred to, demonstrated that the sutures which reunite an intestinal wound, hold mechanically for two days, then grow gradually less secure for the next three days, owing to the development of granulation tissue about them in the healing process. But from the fifth to the seventh day, they hold more and more firmly as scar tissue forms; at the expiration of this period, it is deemed safe to permit the normal use of the intestinal segment, which is the seat of the wound.

Interval cases furnish, to all intents and purposes, well people before the expiration of this period of food and cathartic prohibition.

In an early *suppurating* case, it should always be a simple matter to find and remove the appendix, but the after-treatment is quite a different matter from that accorded the clean individual with primary suture of the abdominal wall. Here the local needs consist

of drainage and wound treatment, while the general care of the patient is of utmost importance.

Drainage is frequently a matter of grave import here. It is my custom to tie with catgut a soft strip of folded rubber to the appendix stump (Fig. 357). This insures drainage down to the point where it is most likely to be wanted, and protects the individual should a fecal fistula break through. This drain is not removed until the catgut has become absorbed, usually at the expiration of four or five days. An occasional fecal fistula may be observed for a day or two, where the appendix has been ligated too high up on the intestine. Still, in spite of such a temporary drawback, this remains, so far as I know, the quickest and safest way of managing the

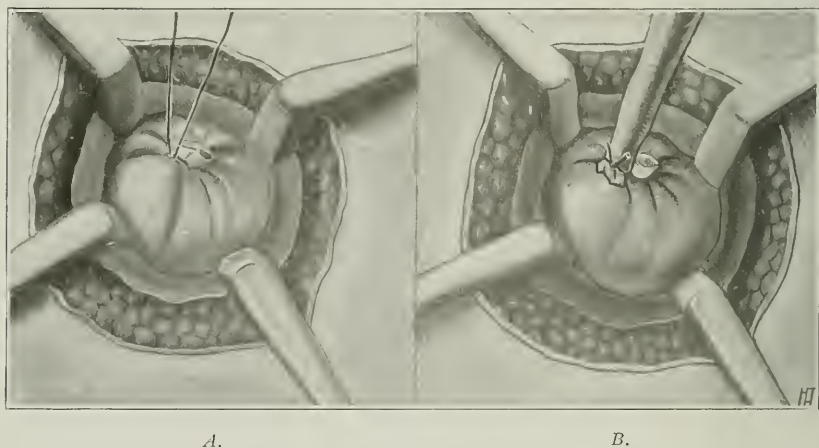


Fig. 357.—A. A pus appendix treated by simple ligation with catgut. B. A soft rubber drain tied in the catgut ligature of the stump.

greatly infiltrated appendix. A split rubber tube will have been inserted into the pelvis, or into the right flank, provided a purulent collection has been detected at the time of operation, in one of these spaces. It is my custom to remove it within twenty-four hours, because no adequate drainage of a portion of the peritoneal cavity takes place for any length of time, in view of the fact that the viscera very early seal themselves together around any foreign body. A further reason for removing such a comparatively unyielding object is the danger of pressure decubitus of a large vessel, of the urinary bladder, or of a coil of intestine.

During the time the drainage tube is in place, we maintain a *posture* which places the incision as low as possible. In other words, the patient usually lies on the face or inclines to the right side, thus favoring to the utmost degree down hill drainage during the twenty-

four hours, or thereabout, that the tube is in position. In order to prevent infection of the subcutaneous fat, I usually employ through-and-through superficial drainage by a folded soft rubber, over which a stitch is taken, in the middle of the skin incision. Two or three days usually suffice for this drain to have subserved its full function. After the removal of all drains, and as soon as the purulent discharge has considerably diminished in quantity, the skin edges are tightly strapped together.

So far as wound *dressings* are concerned, they can be dismissed with the brief statement that I do not use them at all in such cases. Nothing is more annoying to such a patient than the secondary inflammatory skin reaction which comes from allowing a filthy pus poultice to remain in contact with it while covering the wound. A cradle is used to hold up the bed clothes, and if the patient does not find it too disagreeable an electric light or two may be placed above the wound, in order to gain the further advantage of heliotherapy. Such patients get up at the expiration of eight or ten days, and the earlier they do get up the better, since every muscular effort on the part of the abdominal wall tends to close rather than to hold open the lips of a McBurney gridiron incision.

The *general care* of such a patient consists in keeping him on a well-screened and protected porch constantly, and in following out what we term "peritonitis treatment." This is adequately described under the title elsewhere, and is made up chiefly of morphine, stomach lavage, hypodermoclysis, and prohibition of anything to be swallowed, the idea being to limit peristalsis, and thus prevent the spread of infectious matter. I do not feel warranted in making any general statement regarding the time that must elapse before fluid feeding should begin. In some patients it seems safe the day after operation, but in others, many days must elapse before no symptoms of peritonitis will follow the slightest intestinal activity. Of course, there is no infallible rule in this matter, experience will guide one to a certain degree, but I am free to confess that I have often had to reinstate the treatment more than once in the same patient.

A *late purulent appendix* case presents a number of dangers, complications, and postoperative problems, which may be termed fairly unique for this field. Let us suppose a week or two to have elapsed, that local and general conditions, which can not be considered in a work of this kind, have demanded a drainage operation. The prudent surgeon has not made more than a cursory search for the appendix, and if our own experience is any criterion, he has

not found it. He has had to content himself with the introduction of a drain and the institution of "peritonitis treatment," as just detailed, and in many instances this suffices to hasten the convalescence; if now the surgeon be a man of experience in abdominal surgery, he will wait the six months which Koehler advises, without making an interval attempt (Fig. 358) to remove the appendix, as a prophylactic against further trouble. As a rule, six months must elapse before the anatomic difficulties, which prohibited the primary removal of it are so fully dissipated that the removal is thus rendered easy and safe.

Unfortunately not every such drainage operation terminates so happily as just outlined. Not infrequently a fecal stone left in the peritoneal cavity, or some sloughing tissue will lead to the formation of a more or less permanent *pus sinus*. There is very little to do in

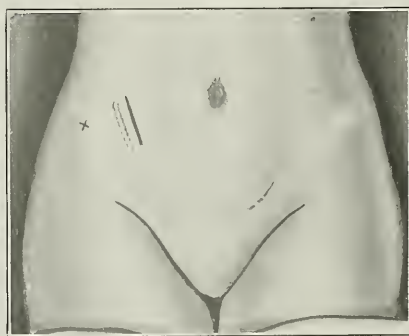


Fig. 358.—The proper position of the secondary incision for removal of the appendix, months after drainage of a primary pus appendix.

the way of relieving this until nature throws off the offending foreign matter. An interesting example of this complication has appeared twice in my practice. Both times a highly diseased appendix has torn in two near the bowel, and the distal portion of it has been lost from view. The patient's condition precluded an extended search both times, hence, drainage had to be instituted. One patient discharged pus for three weeks, then promptly recovered when the necrotic appendix-rest came out spontaneously. The second appendix had an adequate blood supply, and necessitated secondary removal one year later, before the sinus ceased to discharge.

A *fecal fistula* is not at all uncommon where a highly diseased appendix is left in a suppurating wound. Of course, all who have had experience in this field, know that, provided the wound be deep, and the gut not obstructed, there is a strong tendency for such a

fistula to close spontaneously. However, I remember more than one case which persisted for the entire six months, which should elapse before an operative attempt is made to remove the offending structure. For further fecal fistula drainage details, the reader is referred to the chapter so named.

Secondary pus collections, limited by various viscera and the abdominal parietitis, are not at all uncommon where the appendix has been left *in situ*. I have been called upon occasionally to drain such cavities, although in most instances they will take care of themselves (even though they may break into hollow viscera) provided the peristaltic function of the intestines be inhibited so far as is commensurate with the patient's general condition.

As is well known, liver abscesses, subphrenic abscesses and transdiaphragmatic empyema are rare but well-defined complications of this malady when inadequately or tardily treated. I remember one such case, in which such a chain of pus collections as those referred to, emptied themselves spontaneously by rupturing into a large bronchus, with the prompt recovery of an exceedingly sick patient. I have seen spontaneous rupture of a secondary abdominal pus cavity through the abdominal wall, and must say that there seems to be almost no limit to the possibilities for trouble in these cases, provided only that the patient has resistance enough to live until he may experience them all. *The local treatment* of such a patient differs in no wise from that which has been indicated for an early purulent case. The management of drainage, secondary wound closure with adhesive straps, the use of no dressings, but the employment of heliotherapy instead, were each mentioned in preceding paragraphs. The patient does not get up until his septic symptoms have subsided, which is frequently at a very remote period, but during this time he lives on a well-protected porch, and every effort is made to favor the increase of resistance by forced feeding.

Diarrhea of a septic nature has rather often complicated these cases in my experience, the control of which must be considered in detail with the individual case. I have been wont to employ carbohydrate feeding and have made most *liberal* use of morphine, opium suppositories, and paregoric. I will say, however, that the control of such a diarrhea is sometimes a matter of the greatest difficulty, and we would counsel serious consideration of it. I have very frequently had to profit by the advice of a gastroenterologist before this complication was satisfactorily overcome.

One must, for the sake of completeness, mention in this connection the possibility of *intestinal obstruction*, resulting from adhe-

sions which kink or constrict the intestine, to say nothing of the very common dynamic ileus, due to localized peritonitis so commonly seen with appendicitis. Mild recurring attacks of the mechanical variety are common enough and may become complete in nature, provided they are not recognized early, or if cathartics be employed

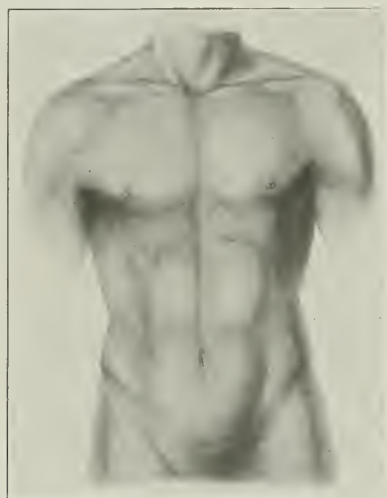


Fig. 359.—The musculature of the abdominal wall.



Fig. 360.—The position of the skin incision in the McBurney gridiron operation.

in the treatment. This complication has been seen most frequently about the time the patient leaves the hospital, having as a rule, followed some indiscretion in diet. I clearly recall, on the other hand, one fatal case, where the operation was many years past, and the patient's health perfectly satisfactory in the interim. The mild attacks can be aborted, as a rule, by putting the intestinal tract ab-

solutely at rest. The treatment of these complications is taken up *in extenso* under the caption IIens.

Postoperative hernia is a self-evident complication of a class of

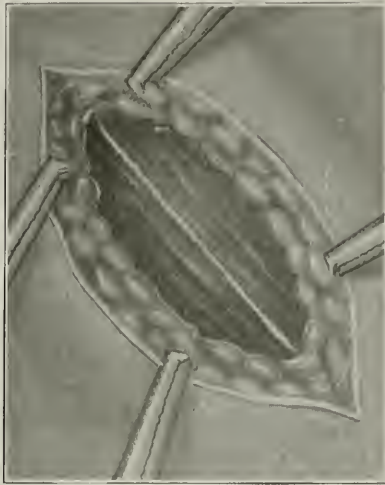


Fig. 361.—Splitting the fascia of the external oblique longitudinally.

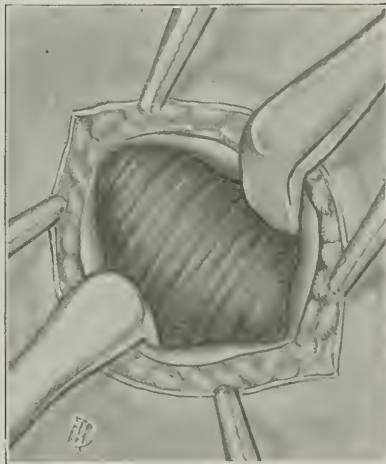


Fig. 362.—Retraction of the external oblique for the longitudinal splitting of the internal oblique.

wounds which are infected and drained with great frequency. This is especially true in the hands of those who persist in the use of incisions which are too long, or which violate anatomic and physiologic

requirements. A muscle splitting "gridiron" incision (Figs. 359-363) of the McBurney type may be left wide open (Fig. 364) and drained of pus or feces for many days without the risk of more than an

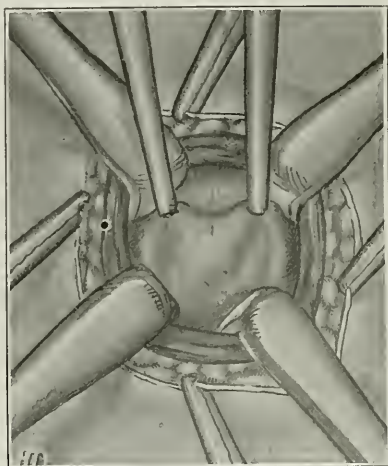


Fig. 363.—A small opening being made in the peritoneum.

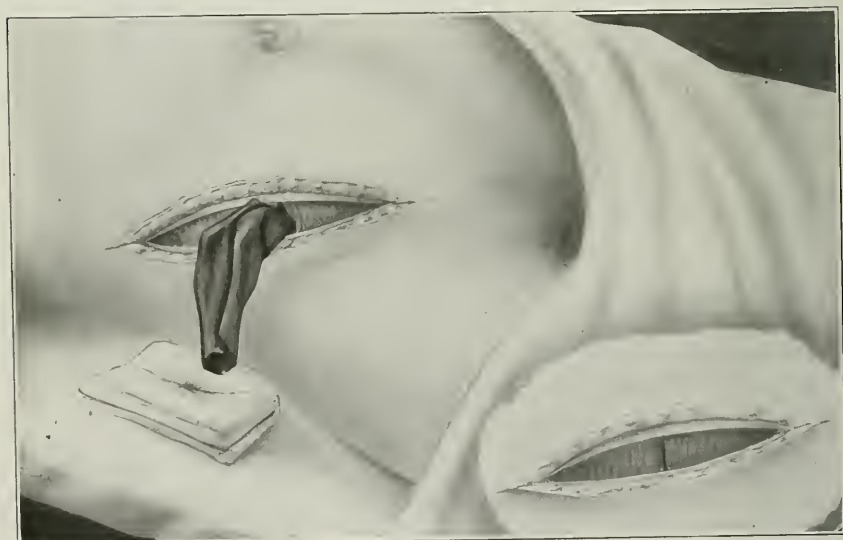


Fig. 364.—The McBurney gridiron incision left wide open with soft rubber drain protruding.

occasional hernia, so strong is the tendency to spontaneous approximation (Fig. 365) of the wound edges when the affected muscles are adjusted to their physiologic use.

Dr. Stuart McGuire gives the following instructions to patients who have been operated on for reflex stomach troubles:

Your wound requires no further attention.

No binder or special type of corset is necessary.

Your stomach was carefully examined at operation, and showed no evidence of disease. As is often the case, the stomach symptoms were due to trouble outside the stomach, which has been corrected.

The full benefit of your operation will be experienced gradually. You should avoid starving yourself on account of stomach symptoms. Especially at meal time, put aside care. Don't be afraid to trust your digestion. Don't abuse it, but use your stomach confidently.



Fig. 365.—The skin approximated with adhesive after drainage has ceased.

Your diet should be generous and wholesome. Highly seasoned and greasy foods, pastries, pickles, condiments and notably indigestible articles should be avoided.

Tea and coffee should be used only in moderation.

Drinking water should be neither limited nor pushed to excess.

Your use of alcohol and tobacco should depend somewhat on your former habit. Decrease rather than increase.

If there is a tendency to constipation try to overcome it by natural means such as water, diet, exercise and the establishment of a regular hour of going to stool. An occasional mild laxative may be necessary.

Regular exercise out of doors is important. Begin with a walk of three or four city blocks and increase gradually.

Get plenty of fresh air day and night. Sleep with the windows open.

Tub baths are not injurious.

Careful attention should be paid to the toilet of the mouth.

Ample hours of sleep and rest are important until your health is completely restored. Worry, excitement, undue annoyance, overindulgence of any kind, rapid eating and insufficient mastication of food, all should be guarded against. Avoid excessive fatigue, but don't be afraid of wholesome work increased at a moderate rate.

Your physician is fully acquainted with what has been done for you at the hospital, and can advise you as to the time when you can safely resume your full duties. He can guide you along the lines of patient and persistent re-education of the stomach and other bodily functions to their normal work.

Please report your condition by mail at the end of three months. If you are well, the information will help us, if you are not well, we may be able to help you.

CHAPTER LXXIV

THE PANCREAS

By Willard Bartlett, St. Louis, Mo.

Total Extirpation.—Total extirpation of this viscus is possible in some of the lower animals without an immediate fatal outcome. However, Robson and Moynihan aver that the organ can not be completely removed in the human subject with any chance of the individual surviving the operation. Hence, it stands to reason that there is no after-treatment under such circumstances. Very considerable portions of the tail of the organ have, however, been removed with most satisfactory results. This has been done both as amputation and as resection in continuity (Fig. 366).

The after-treatment differs from that of many other high abdominal operations only in so far as *prophylaxis* is concerned. It deals essentially with the matter of careful suture of exposed pancreatic surfaces in order that leakage may be limited. A drain, preferably of soft folded rubber, is to be carried down to, or better, attached by catgut to the suture line, and brought out at a convenient portion of the skin wound. The amount of drainage under such circumstances is not likely to be large. However, the patient's skin must be carefully protected against any fluid which may appear. It will otherwise be promptly digested and a most annoying wound be thereby produced. I have found zinc oxide paste or a more or less constant tub bath to serve extremely well under such circumstances.

Prolapse.—There has been no little discussion and disagreement about the possibility of a pancreas prolapsing through an abdominal wound. In many of the reported cases postmortem examination of the protruding viscus has shown it to be made up of omentum, or something else, which had been erroneously taken for pancreatic tissue. Robson and Moynihan, however, state that there are eight well-authenticated cases on record in which this accident really did occur.

The treatment here will be largely prophylactic and consist in the observance of the ordinary measures which tend to prevent the breaking down of an abdominal wall wound with sudden extrusion of the contained viscera. In other words, the attempt must be made

here, as after every laparotomy, to keep down intraabdominal tension by regulating the functions of the respiratory, gastroenteric and urinary systems to the extent that no undue strain will attend the

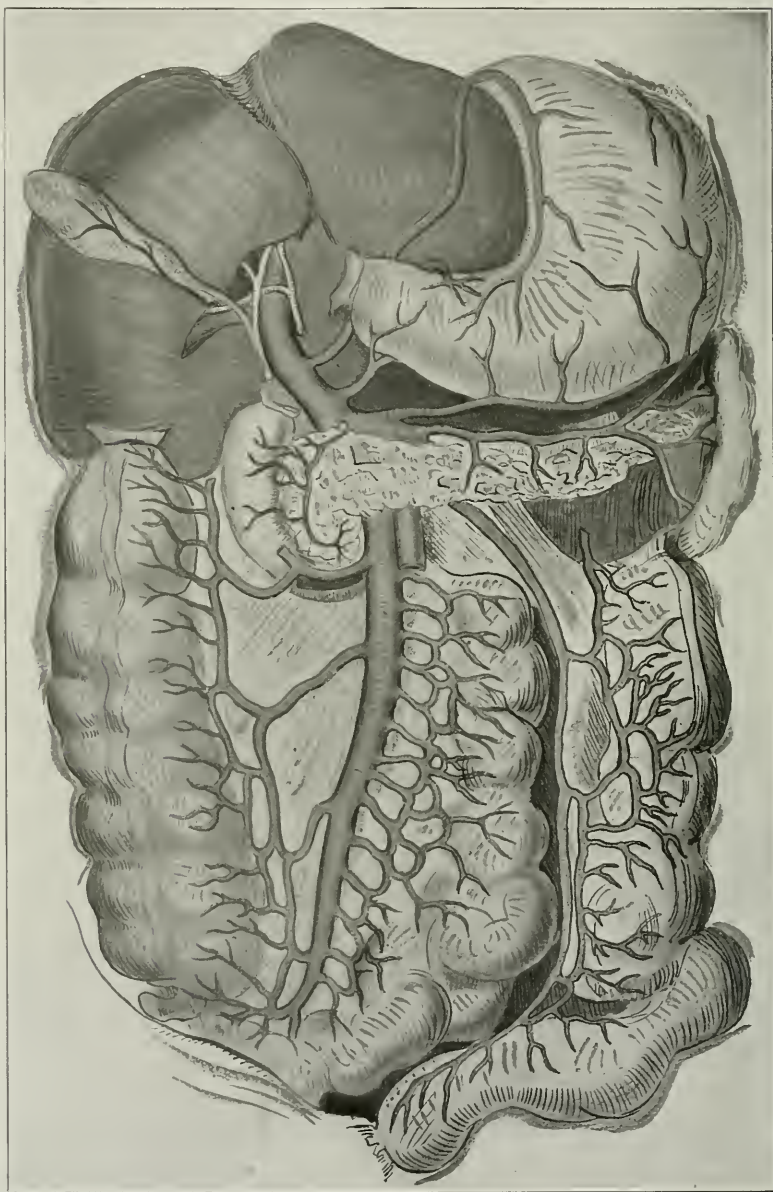


Fig. 366.—The position and relations of the pancreas. (After Gray.)

use of any of them. When such a prolapse does occur, it is, of course, to be treated along the general lines laid down in the chapter devoted entirely to this subject as it affects all of the other abdominal contents.

Injury.—Since gunshot and stab wounds of the stomach so frequently involve the pancreas as well, it is essential that the complications and after-treatment should be thoroughly understood. A well-known example of this kind, perhaps the most notable that ever occurred on this continent, was the assassination of the late President McKinley. The bullet in this instance injured the stomach, pancreas, and one kidney. Hemorrhage, due to the exceeding vascularity of the organ, may be an immediate feature of prominence, or may occur at any time in the convalescence, as a consequence of tissue necrosis. Fat necrosis is almost certain to supervene upon any extensive liberation of pancreatic fluid unless drainage be perfectly effectual. Localized, and even general, septic processes are the rule following such injuries, due in part, no doubt, to the devitalizing effect of pancreatic juice, which allows for the early development of the accidental infection acquired at the time of injury. Dynamic ileus is almost certain to appear in outspoken cases, the mechanism of it being explained (in a special chapter on this subject) in exactly the same manner as it is where there is an accumulation of blood, pus, urine, bile or any other unwonted fluid within a portion of the peritoneal cavity.

The prophylactic treatment calculated to obviate the characteristic complications just referred to consists in the judicious and intelligent use of suture, ligature, and drain as quickly as possible after the original injury. Experience has shown, as in the notable case cited above, that very little can be accomplished in a remedial way after these well-known symptoms are present in all their intensity. Hence, additional stress on the prophylaxis may be considered in order.

Acute Pancreatitis.—Drainage is the key word to the after-treatment in the three forms of pancreatitis. There is, however, in each of the three a different form of drainage indicated; hence, it is well that they be sharply defined.

In the *acute* form one must drain the *gland* itself. An operator of experience will tear into various portions of the swollen seminecrotic organ upon the discovery of the characteristic thin brownish fluid in the peritoneal cavity, even though fat necrosis may not yet have assumed its characteristic appearance and proportion, and

will place soft rubber drains directly down into the rents which he has made. The patients are always so desperately ill that a prognosis is of uncertain value at the time of operation. The outcome depends in great measure, after the operation is past, upon the patient's resistance. Hence, the postoperative regime will be calculated in every way to increase this vital quality. We have at our command, unfortunately, nothing specific in this direction, unless the term can be applied to blood-transfusion, which undoubtedly combats the specific hemorrhagic tendency so distinctly manifested by this disease. If the patient survives the early postoperative period, the ordinary forced feeding, exhibition of fresh air, etc., will be indulged in as a matter of course.

The writer has been so impressed with the great danger attending this complication of gallstone disease that he can not refrain from urging early surgical intervention and careful scrutiny of the pancreas in every outspoken gallstone attack which is of greater duration than those to which the patient has been accustomed, or in which the individual is much more prostrated than has been usual, or in which new and not understood manifestations of any sort have occurred in the attack. In two very recent instances where I operated for acute pancreatitis, the diagnosis was correctly made on nothing more than the somewhat indefinite observations just cited.

Subacute Pancreatitis.—Subacute pancreatitis again entails drainage as the chief factor in the treatment. However, in this instance we have to do with drainage of single or multiple *septic foci* which have had time to establish themselves in or around the pancreas as the disease has progressed from the acute into the subacute stage. Fat necrosis will now have become so outspoken as to prevent the possibility of missing the anatomic diagnosis where the abdomen is open, and the prognosis will in most instances be more favorable than in the acute stage. This is, however, not to be regarded as an argument for nonoperative treatment of the acute form of the malady, since the mortality is probably very much higher under such circumstances than if the individual had been relieved upon the onset of the first acute symptoms.

Chronic Pancreatitis.—Here again the chief consideration is drainage, but now it is drainage of the biliary passages, accomplished, it may be, through the use of a tube in the gall bladder, but in a large percentage of cases this is impossible on account of the shrinkage of that organ, hence the common, or hepatic, duct will have to be opened and a tube inserted.

I have frequently tried to accomplish adequate drainage where the gall bladder had been distended and full of bile, by means of an anastomosis between it and some portion of the gastroenteric tract. I have been finally forced to agree with Robson and Moynihan, as a result of unfortunate experience, that direct tube drainage to the skin is on the whole much more efficient and satisfactory. It is true these patients have to endure all the discomforts of a biliary fistula for at least a year. Still, at the worst it is a temporary matter and is distinctly preferable of the complications which I have seen where an anastomosis was made with one of the following hollow viscera. The wall of the stomach is so thick that the gall bladder will not drain into it adequately and the opening tends to close spontaneously. There is always the danger of duodenal leakage with a probably fatal result, unless a very perfect mechanical piece of work has been done between the gall bladder and that segment of the bowel. Any other portion of the small intestine may become kinked and obstructed provided it be used, while ascending infection out of the conveniently located colon, in my opinion, forbids its use for this purpose. The rule is to keep an external fistula open until the bile appears healthy, and until most of it goes into the common duct. However, as above stated, a much safer rule is, in my own opinion, to drain these patients arbitrarily for one year. Where drainage ceases too early, even though the patient may long since have been free from all symptoms, there is still great danger of recurrence.

The tendency to hemorrhage in obstruction of the common bile duct with jaundice is greatly increased where a pancreatitis complicates the picture. Hence one can not go amiss in such an instance by making a prophylactic blood transfusion. I have saved such patients from what threatened to be a fatal postoperative hemorrhage by this means, and have now established a routine practice of making a preliminary transfusion two or three days before a drainage operation is attempted for chronic pancreatitis with jaundice, whether gallstones are suspected or not.

A case in point which accentuates the value of this procedure is under treatment as this chapter is written. A woman in middle life became deeply jaundiced six weeks before I saw her, with symptoms which led to a perfectly easy diagnosis of chronic pancreatitis with probable presence of gallstones. A few days before she was brought into the hospital, she became almost exsanguinated as a result of uterine hemorrhage, and this in a patient who had never had symptoms pointing to the genitourinary apparatus, and who

was almost certainly not pregnant at the time. She bled slowly until the hour of the transfusion, and now, some weeks later, is on the road to rapid recovery, there having been no further bleeding from any source and the subsequent operation having been attended with less than the amount of hemorrhage which characterizes an ordinary gall bladder drainage.

Cancer.—The prognosis after an exploration for cancer of the pancreas—and of course no other operation will ever be attempted—is so bad that one must be warned against any operative maneuver in the presence of this disease if the diagnosis can, with any degree of certainty, be established beforehand. In one such recent instance, however, drainage of the distended gall bladder relieved all the patient's symptoms, and she left the hospital with the statement that she felt extremely well repaid as a result of her experience. This, however, is a rare and almost unique case, as far as my practice goes. Where the abdomen is opened under such circumstances and a distended gall bladder is found, I believe on the whole it is better to waive the objections stated above and make an anastomosis between the gall bladder and the most convenient portion of the intestinal tract, provided, of course, that one does not decide to simply close the abdomen hastily and do nothing at all.

In cancer of the pancreas drainage has, of course, to be maintained as long as the patient lives, and since no great amount of good is to be expected, it seems like adding insult to injury to establish an external biliary fistula with its attendant discomforts, in addition to the prospect which such a patient has already to face.

There is one argument in favor of establishing drainage in what is *supposed* to be a cancer of the pancreas, provided, of course, that one can not demonstrate definite cancer of the gall bladder or liver, since the mere size and consistence of the pancreas itself by no means always enables the operator to make a definite diagnosis. Many a case in which cancer was suspected has after a year of drainage turned out to have been chronic pancreatitis all the time, as evidenced by the fact that the patient returned to normal health.

In a recent cancer case, even though drainage was adequate, a large amount of sugar persisted in the urine up to the time of the patient's death. This may be of some diagnostic value in a perplexing case.

Cyst.—Cyst of the pancreas is a vague term and really should not be used unqualified, since it covers a number of anatomic possibilities. Robson and Moynihan in their classical monograph to which reference has been frequently made in this chapter, classify

six kinds of pancreatic cysts. I am inclined to think, however, that an anatomic diagnosis of all of these six varieties is possible only at autopsy. Hence, for clinical purposes it may not always be easy to describe the lesion more definitely than by the use of the simple word to which exception has been taken.

The surgeon who has operated upon such a fluid-containing tumor of the pancreas will have contented himself with approaching it either through the supragastric or the infragastric route, as may seem more direct in the given case, and after packing off and opening the cavity have sutured its wall to the skin. Long-continued *drainage* is now in order, and in most instances it will suffice to gradually reduce the amount of packing and to shorten the tubes as the cavity obliterates itself, until there will no longer be any defect present. No such favorable outcome, however, is to be expected when the efferent pancreatic duct has communicated with the cavity of the cyst. Under such circumstances a large or small fistula is quite likely to persist.

I call to mind one very typical patient of my own on whom I operated in something of an emergency for the relief of dynamic ileus, and treated a large pancreatic cyst by the supragastric route as above suggested. At the original exploration stones could be felt in the gall bladder. However, the patient was so extremely ill that no attention could be paid to the biliary apparatus at this time. After what proved to be a false pancreatic cyst, that is, one without a true cyst wall, had become obliterated in the course of a few weeks the patient felt so perfectly well that she refused to have anything done for the original gallstone disease and left the hospital. One year later she came back, stating that she had had another of her old gallstone attacks which had been present long before the cyst formed, and requested operation. Her gall bladder was removed and her ducts drained, there being, as near as could be ascertained at the time, a perfectly normal pancreas. One year after the second operation she was still in perfect health, there never having been any recurrence of the pancreatic symptoms.

CHAPTER LXXV

THE SPLEEN

By Willard Bartlett, St. Louis, Mo.

The removal of the spleen, a fairly common surgical procedure, entails at times, considerable difficulty in the control of the organ's blood supply. Not only is this true at the operating table, but all of the postoperative complications which may later arise can be traced directly to faulty hemostasis. I remember very well in one of the first splenectomies that I ever saw, the pedicle was so short and thick as to be practically uncontrollable, with consequent loss of so much blood that the patient never regained consciousness, and died at the expiration of twenty-four hours, as a direct result of acute anemia. This was in the era which preceded blood transfusion, else the individual might have been saved.

Secondary hemorrhage has been rather commonly reported after splenectomy, although this should in reality be a very rare cause of death, since the blood supply can be adequately controlled while the abdomen is open, or else this definitely *can not* be done, under which circumstances the hemorrhage should be immediate and the determining factor in the convalescence. If on the other hand, adequate control is exercised, one should have very little to fear later from this source.

As an example of the fact that difficulty in controlling the blood supply leads to ultimate distressing complications, I will cite a case which came under my observation some years since. It was possible to remove the spleen without immediate loss of blood, but after the organ was out and the severed blood vessels had retracted, it was found most difficult to ligate them, so on the patient's condition becoming alarming, it was determined to leave the clamps in place for a few days, wrap gauze around them, and hastily close the abdomen. They were removed without great difficulty some days later, but the patient afterwards died of peritonitis, because the normal peritoneal cavity had been left open. There is much evidence to show that this is a most pernicious practice and not to be followed where it can be avoided.

Another example of what may follow operative difficulties with the blood supply of the spleen is seen in the following case recital:

An attempt was made to remove a very large spleen in Hodgkin's disease. So many enlarged lymph nodes were encountered in the hylum that the blood vessels could not be easily isolated or controlled. After several efforts to accomplish this object, the splenectomy was abandoned, but by this time several veins had been torn and there was no recourse but to leave gauze pressure-packs in the affected areas, and partially close the abdomen. All of them, as was thought, were removed a few days later, and the patient did well for some time longer, when to the surprise of everyone connected with the case, a gastric fistula developed into the wound. The patient lingered but a few weeks longer, and after death the autopsy showed that one pack had been left behind, had caused pressure necrosis of the stomach wall, and thus produced the fistula. It will, therefore, be seen that difficulties in the *control of the blood supply during a splenectomy* may, in many ways, be the determining factor in the outcome of the case.

A most unusual complication of splenectomy was observed recently in one of our St. Louis hospitals. The patient, a young woman of twenty-four years, had a very marked movable *kidney* on the left side, with the typical manifestations of every sort. An operation was decided upon and the customary lumbar incision made. The operator was surprised to find the highly movable organ within the peritoneal cavity, and after incising the peritoneum, determined without difficulty that he was confronted by a *spleen* which dropped far down into the abdomen and clear across the midline to the right. Naturally supposing that his diagnosis had been incorrect, he abandoned a search for the kidney and did a splenectomy. The patient made a fairly normal recovery, but had no sooner reached home than she was again the victim of the same sort of attacks as those which had led to the operation. One can readily imagine the surgeon's discomfort, when another physical examination was made and he discovered the movable kidney just where it had always been, and recognized for the first time that he had previously overlooked the fact of the spleen as well as the left kidney being highly movable, and had, therefore, merely operated on one of the patient's outspoken lesions.

One who has had an extensive experience in splenectomy is very early impressed with the fact that the removal of the organ as such, creates practically no gross clinical *deficiency symptoms* in those who survive it. If it were not for the numerous postoperative blood studies which have been made in the recent past, I should

be inclined to assume that extirpation of the spleen had absolutely no effect of any kind.

One can not fail to be interested in the less obvious *ultimate results* of splenic extirpation, those which were not fully known until the publication of rather recent studies of the blood of such individuals. Perhaps the best resumé of this matter at our disposal is the paper of Hitzrot which appeared in the *Annals of Surgery* for May, 1918. This author not only epitomizes the knowledge of others, but has done very considerable experimental work and reported the ultimate results of numerous splenectomies. The remainder of this chapter will be devoted to abstract quotations from his paper.

He divides the results of splenectomy in the normal individual into five separate phases; namely, a temporary change in the blood picture; an alteration in the resistance to hemolysis; the temporary appearance of iron in the stools; a temporary increase in the fat and cholesterin in the blood (of dogs, at least); and a temporary decrease in the antitryptic and bactericidal properties of blood serum.

The blood picture is changed to the extent of a progressive anemia making its appearance shortly after the operation, being most pronounced at the end of a month or a month and a half, and then gradually disappearing about the end of the fourth month. The red cell count keeps pace to a certain extent with the decrease and secondary increase of hemoglobin during the periods mentioned. The blood picture changes also so far as the leucocytes are concerned, these continuing to increase rapidly in the early preoperative period, and then returning gradually to normal by the end of the fourth month. The change concerns the polymorphonuclear cells chiefly (in animals, at least). The same thing has been true in the human subject where a white cell count has been made. In one of the author's cases the height of 68,000 was recorded. Strange to say, the count has been highest where there has been most hemorrhage, and lowest where practically no hemorrhage has accompanied the splenectomy.

The red cells resist hemolysis to an unusual degree in the hands of all the authors who have investigated this phase of the subject. Not only has this been true in animal work, but in the human subject. Hitzrot found it to begin on the eighth day and to last as long as nine months.

An increased output of iron in the feces has appeared, commences about the fourteenth day after the operation, and has been found

to continue for at least three months. This is particularly true of individuals on an iron-free diet.

Fat and cholesterol have been found in the blood of dogs in increased quantities for about two months after splenectomy, a maximum amount being reached some two weeks after the operation. It is thought by Bloor that the same thing should hold good in the human subject, although this seems not to have been determined definitely as yet.

A distinct practical value attaches to the conclusion that there is a transient decrease in the bactericidal properties of the blood after splenectomy. This may be explained by the fact that splenic tissue causes an increase in the natural protective substances in the blood. In addition to the above, there has been found an increase in the vital staining red cells, this having persisted for twelve days and returned to the normal about the end of three weeks.

The above conditions are all supposed to affect the normal individual who has been splenectomized for traumatic hemorrhage, and who has had no disease of the spleen as such. Removal of the organ for *morbid conditions* associated with enlargement of it have led to postoperative blood studies which are not less interesting. Two patients operated upon for Banti's disease, who were followed for a protracted period, showed the same drop in hemoglobin and red cell count as marked the postoperative course of the individual who had had a normal spleen removed. Practically the same may be said of the white blood cells, although in both instances the changes were less abrupt following the operation for pathologic spleen. Fragility tests and vital staining of the red cells in the pathologic cases appeared to follow a similar rule to that which obtains in the normal. Both these patients did extremely well in every clinical particular.

In a case of anemia with enlarged spleen, which the author was unable to classify more definitely, practically the same results were obtained as above, with the exception that there was almost no change in the matter of hemolysis. In two cases of hemolytic icterus there was, on the other hand, a rapid rise of red blood cells and hemoglobin in marked contradistinction to the tendency detailed for the normal individual. Fortunately this has remained a permanent feature of these cases, and, as the author states, strongly differentiates this disease from the other types of anemia with splenic enlargement. There was here very little change in the white cells, however.

In one case of von Jaksch's anemia there was also a marked im-

mediate increase in hemoglobin and red cells, which also has, fortunately, been a permanent feature in the case. There was in this instance a shower of nucleated red cells noted a few hours after the operation.

The value of *splenectomy in pernicious anemia* can not be directly expressed as a definite entity. If the trouble is with the blood-forming organs, one can, of course, not hope for anything from this operation, and indeed we can not always state that the patient will be benefited where the trouble is definitely one of increased blood destruction. There is surely one class of individuals under forty in whom there is increased destruction together *with splenic enlargement*, which probably has something to do with the matter, and in them a definite cessation of their paroxysmal trouble can be brought about, and they can be permanently cured by the removal of the spleen.

Hitzrot says:

“In general, the evidence for splenectomy may be said to be anemia of the hemolytic type with enlargement of the spleen, the occurrence of hematogenous crises or evidence of periodic increase in blood destruction and the failure to find any evidence of focal or constitutional disease to explain the cause for the anemia.

“If the vital staining cells are present in an increased ratio above the normal, splenectomy must be considered and the greater this increase the more definitely does the blood present evidence of increased hemolysis as compared to decreased blood formation.”

CHAPTER LXXVI

THE PELVIC ORGANS OF THE FEMALE

By Willard Bartlett, St. Louis, Mo.

There are many reasons why the after-treatment is of peculiar importance in this realm of surgery. Age-old sentimental considerations surround every destructive surgical endeavor when applied here. The physiologic considerations which apply to the ovaries, tubes and uterus are so important that they must be given due weight. Then, finally, the very propagation of the race being dependent upon these organs everything which has to do with surgical operations performed upon them, whether destructive or constructive in character, must be given a consideration which is second to none accorded any but the three vital organs.

The Ovaries.—As a preliminary consideration it may be stated that surgery of the ovaries has no special significance after the climacterium. It goes without saying that it is most important during the child-bearing period, but is not by any means to be forgotten from the time of puberty until child-bearing begins, because of the fact that the ovaries exert, by virtue of their internal secretion, a deciding influence on the development of the individual into the proper or feminine type just as in the male an internal testicular secretion determines the fitting or virile type of the man. The after-care, then, of a young girl in whom both ovaries have been removed concerns itself vitally with supplying a defect which would otherwise stunt the proper development of the individual.

The most of what follows in this chapter on the ovaries relates to the child-bearing period of a woman's life; hence the fact need not be specially mentioned further.

Suppose such a woman has in contemplation the *total removal* of both ovaries. The after-care in her case will be greatly simplified by informing her in advance of the changes, to her thinking of extreme importance, which are certain to follow the operation. In the first place, she should be told that she will no longer menstruate every four weeks or thereabouts, and then, if her mind has been made up to this in advance, she will really pay very little attention to the matter. However, if she is left to face this as an event totally unexpected, the operator may be quite confident that he will have

difficulty in explaining to her satisfaction that some mistake has not been made. She should also be informed in advance that hot flushes and the other characteristic nervous manifestations are likely to appear at her menstrual periods, and she should be led to believe that these are perfectly normal manifestations which in her case really indicate nothing abnormal and in a sense take the place of the flow which women from the earliest times have regarded as essential to their well-being. It is absolutely indicated that she be informed in advance of the fact that she will never have more children. Many a woman is desirous before operation, for reasons best known to herself, of escaping this responsibility. However, her mental make-up is such that, being denied this possibility without any preparation for it, she may surprise the surgeon by a resentment which is out of all proportion to the attitude which might be normally expected. If, however, she has resigned herself to this fate in advance and in a measure purchased health by giving up this function, nothing more will be heard on the subject.

Deficiency symptoms appear, as might be expected, after total removal of both ovaries. They vary in degree according to the individual and in times past have for eighteen months or two years been in some instances a matter of profound concern, not only to the patient, but to her medical attendant. However, since corpus luteum has come into such general use, these symptoms are no longer to be especially dreaded, and if intelligent use of this drug be made there can no doubt be quite satisfactory control.

The after-treatment will, of course, be greatly simplified if the operator finds it possible to leave even the smallest bit of undiseased ovarian tissue on one side, and this is no doubt often quite readily possible unless he be dealing with malignant disease. When the operation has been done for the removal of old chronic tuboovarian abscesses, the result of double gonococcic salpingitis, it will often be practically impossible to distinguish at the original inspection ovarian tissue at all, and even should such be identified, there is good reason to suppose that symptoms might not be entirely relieved if any such diseased tissue be left behind. A woman in whom an unwise choice has been made is pretty sure to feel that an injustice was done her on the operating table if her subsequent health be imperiled for the mere sake of retaining the ovarian internal secretion in an individual whose feminine type has become established and who can no longer have children because her tubes, with or without her uterus, have been removed.

A special consideration comes up in the after-treatment of a woman who has had the removal of an *ovarian dermoid* tumor. Reference is made here to the fact that this disease is very frequently bilateral. It may be that the second ovary has seemed normal or nearly so at the operating table, and that the tumor on the second side is not to develop for some years to come. However, the probability of such a second tumor developing must always be kept in mind and the individual subjected to regular observation visits. The practical aspect of this subject is apparent to any one, but, on the other hand, the operator is never justified in removing

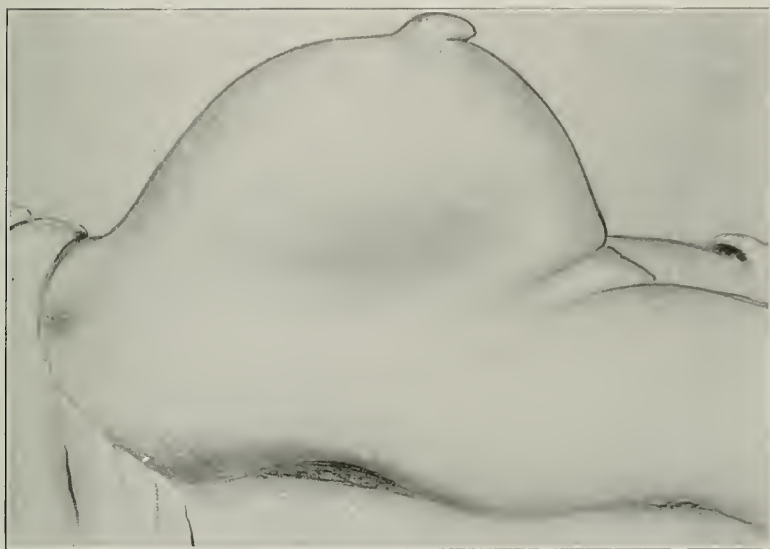


Fig. 367.—Enormous ovarian cystic tumor.

the second ovary until the size of the growth makes symptoms a matter of reasonable probability. A case in point came up in my own experience some years since: The charming young wife of a colleague in St. Louis was operated upon by me when a few months pregnant and a large ovarian dermoid removed. The second ovary was then considerably larger than normal, but still nothing was done to it. Not only was the first pregnancy brought to a satisfactory culmination, but a couple of years later the woman gave birth to a second healthy child, and then, several years still later, had her second ovarian dermoid removed with no special untoward after-effects. It goes without saying that she rejoices in the possession of

two healthy children, whereas less conservative surgery would have robbed her of the possibility of producing more than one.

A physiologic aspect of the surgery which is necessitated by ovarian growths receives less consideration, I think, than it perhaps

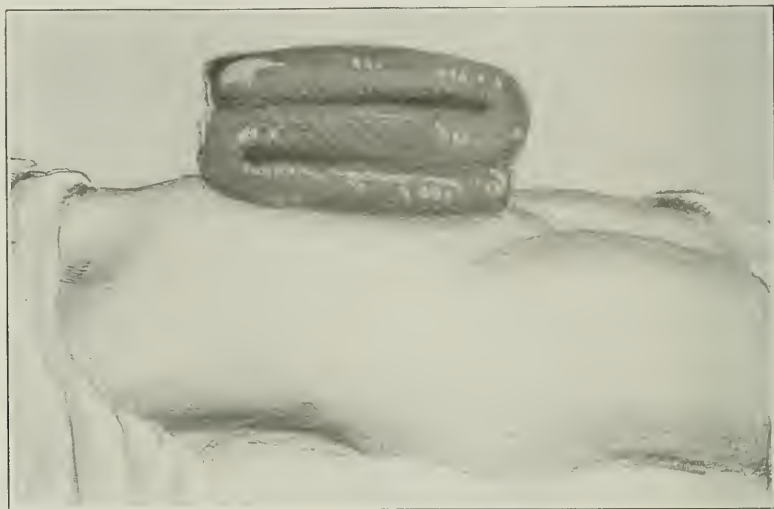


Fig. 368.—Large pad on abdomen.

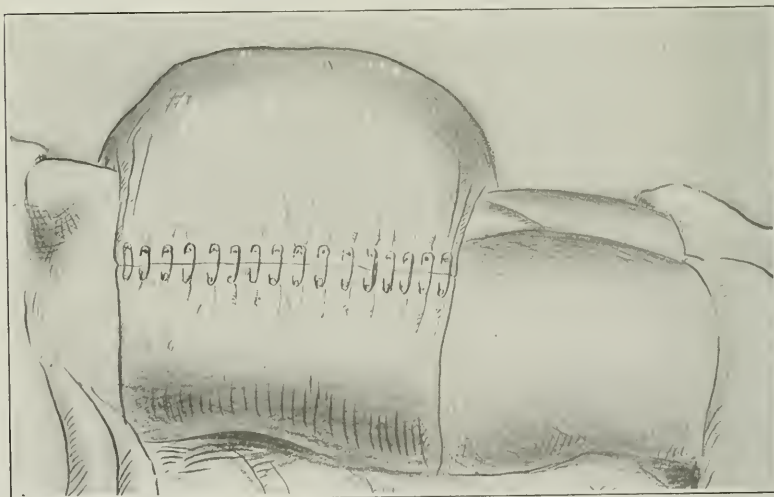


Fig. 369.—Binder pinned on tightly over pad.

should. Reference is made here to the removal of the *enormous ovarian cystic* growths which we now rarely see but which were formerly neglected until they were very much in evidence. The

sudden removal of an enormous mass (Fig. 367) which has long compressed the large abdominal and pelvic veins leads to a disturbance of the automatic adjustment which has gradually been built up as the individual has accommodated herself to the highly abnormal state of affairs. One can readily understand how the sudden relief of pressure may lead to the inflow of a quite abnormal amount of blood into the abdominal veins, with a resulting deficiency in right heart and brain. Hence one definite line of endeavor is indicated in the after-treatment. The patient must have some form of abdominal supportive bandage which will gently compress the abdominal viscera and, through them, the large veins during the early period of the convalescence. This I have endeavored to do by incorporating a folded soft pillow (Figs. 368 and 369) in the dressings and, though I can not claim that it has conduced to the

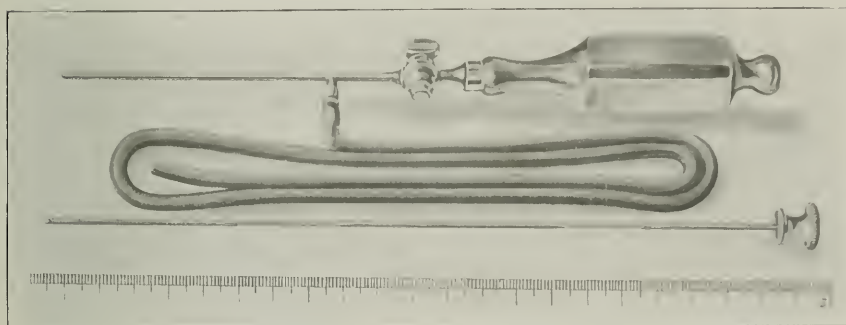


Fig. 370.—An excellent form of paracentesis needle.

patient's comfort, still I believe that this has constituted one of the factors of safety with which we have to surround so many patients if the after-treatment is to prove satisfactory.

I have seen the after-treatment begin the day before the operation in these individuals by paracentesis (Figs. 370 and 371) and gradual escape of a portion of the fluid. A step in the same direction is taken when a cystic ovarian tumor is punctured with a trocar on the operating table and the contents allowed to escape gradually. This would seem off-hand to solve the problem, and I have heard it broadly advised as a routine procedure. However, the man who would employ it and thus render the after-care of the patient free from one of its attendant dangers must puncture such a tumor in the full knowledge that these growths are quite frequently malignant in character, although we have no means of knowing in advance just which tumor is malignant and which is likely to be disseminated

by the slight soiling that is unavoidable provided the growth be punctured before or at the operation intended for its removal. I frankly confess my inability to suggest any general rule governing



Fig. 371.—Preliminary paracentesis of enormous ovarian cyst.

such cases. I must admit that I can not tell whether harm is likely to be done by paracentesis in such instances, hence am prone to individualize when operating. I rarely puncture a cyst where the

patient is a first-class operative risk and where she belongs to the social class who can protect the abdominal wall to a certain extent, even though a long and somewhat faulty scar must be produced. Suppose, on the other hand, the woman be one in whom a very short operation seems indicated, or suppose she be a hard-working individual who can not be expected to lift the wash tub without danger after a scar from her ensiform to her pubis has been produced. I believe here that a surgeon is justified in risking slight soiling with cyst contents, provided the tumor seems to be one of the innocent, thin-walled, nonadherent, unilocular cystic tumors which are usually benign. Malignant cystic tumors are almost cer-

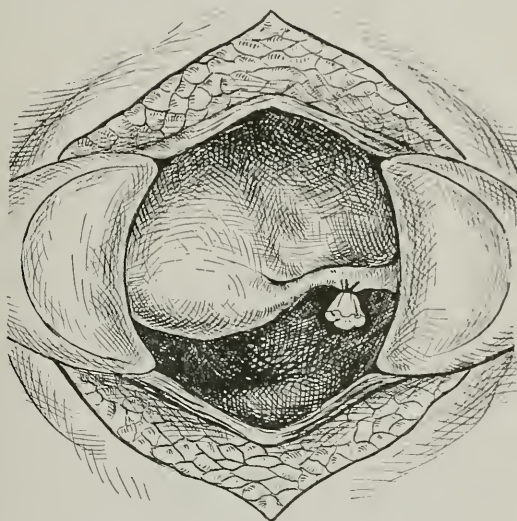


Fig. 372.—Ligature on ovarian stump.

tainly disseminated over the peritoneum with the assurance of early rapid metastatic growth if ruptured, or even if puncture takes place during the removal. Hence the after-care of such an individual becomes a matter of treating inoperable malignant disease within a few months instead of terminating with the ten or twelve days that such an individual remains in the hospital after an operation during the early period prior to the spread of these pedunculated growths.

The after-care of a certain number of *tuboovarian abscess* patients will be rendered distinctly more satisfactory, to the surgeon at least if not to the patient, provided a microscopic examination has been made of the mass removed. It has been my own experience

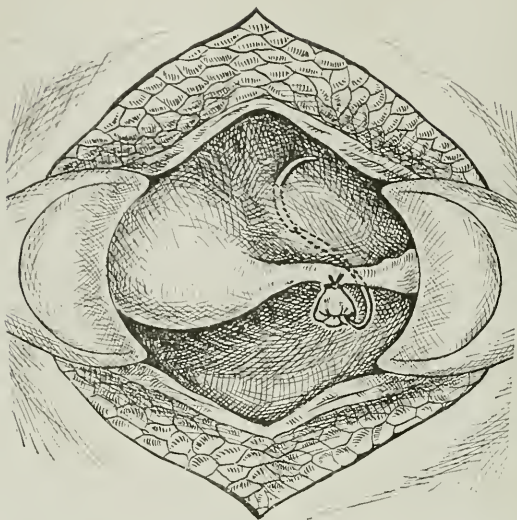


Fig. 373.—End of stump caught in purse string suture which pierces broad ligament from behind.

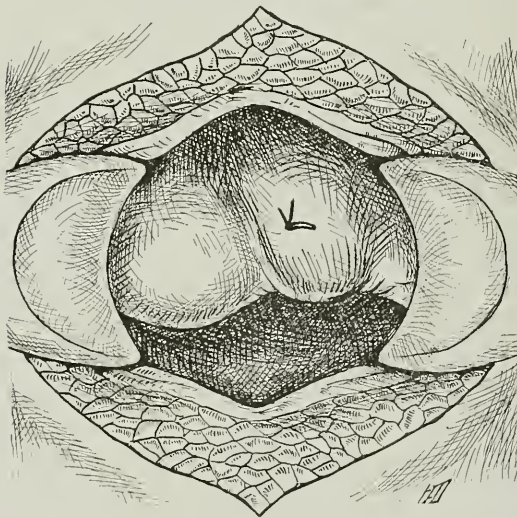


Fig. 374.—Stitch tied in front of broad ligament.

in at least a few of these cases to find that carcinoma appears at some time subsequent to the infection. In all of such patients who have been traced early recurrence has taken place after what seemed to be a thoroughly satisfactory and successful operation, and these individuals have died with symptoms which would have been most difficult to explain had not a tissue examination proved that there was more than a simple tuboovarian abscess at fault. If after the

operation one can predict the course of such a case, he realizes what should be an axiom in medicine, that a man's reputation as a physician depends very largely on the accuracy of this prognosis, perhaps even more so than on the success of his treatment.

In my own experience the after-care of patients suffering from sarcoma of the ovary has been almost as simple and satisfactory as where we have dealt with benign disease. These tumors have been pedunculated, there have been no adhesions, and even though one of them was punctured with a large trocar and not removed on account of frightful hemorrhage until a secondary operation one week later, still I have never seen a recurrence.

Intestinal adhesions to an ovarian pedicle may prove most troublesome, hence it is well to guard against their occurrence as in Figs. 372 to 374.

The Fallopian Tubes.—The after-treatment of an individual in whom the fallopian tubes have been ligated for the prevention of pregnancy, has one highly disappointing factor connected with it, viz., pregnancy is not prevented with any degree of satisfaction in this way. It is quite probable that this is never done in a first class hospital, or by a conscientious surgeon, still, the fact remains that it *has been done*, and no doubt it will fall into disuse as soon as this one salient feature of the after-care is well and generally understood.

The old time removal of the fallopian tubes, after division near the uterine body, produced a pathologic change known as a *cornual exudate*, attended by symptoms of a nature so distressing that it is no longer done by those who are conversant with pathologic anatomy as related to this subject.

By a cornual exudate around the stump of an amputated tube is meant a mass of newly formed connective tissue, which becomes adherent to any adjacent hollow viscus, and produces not only uterine, but also intestinal or bladder derangements of a degree so marked as often to be productive of more distress than that for which the original operation was performed.

Such highly unfortunate complications may be avoided, if at the original operation, the proximal end of the *tube is excised*, together with a wedge cut from the depths of the uterine muscular tissue. It is presupposed, of course, that an immediate and accurate suture approximation of the walls of the defect will be instituted.

Another complication, which is happily rare at the present day, was once quite commonly seen during the after-care of patients who had been operated on for salpingitis. Reference is made to the persistent *sinuses* leading into the depths of the pelvis, which

follow the application of heavy silk ligatures at the original operation.

All of us who witnessed the pelvic surgery which was done at the beginning of this century will perfectly well remember the braided, heavy *silk ligature*, which, for some reason now difficult to explain, was tied with all the force the operator could command, about enormous tissue bundles. As a matter of course, the sinuses persisted until the offending substances were thrown off spontaneously, or else removed at a most difficult and bloody secondary operation. I remember very well, in the period alluded to, seeing one surgeon go so far in this direction as to leave his heavy braided silk ligatures so long after tying, that they were hanging outside the wound, the object being to drag them forth by mere force, at a time when he thought their useful function to have been completely subserved.

In this day and age, when absorbable sutures and ligatures are almost universally employed, especially in suppurating wounds, we no longer see these suture sinuses, and they remain to us merely unpleasant reminders of an era which is fortunately long past.

Bowel injury is perhaps more common during removal of pus tubes, than any other pelvic operation. This comes about in consequence of the many and perplexing adhesions which so frequently bind down these diseased tubes. The consequences of this accident may form the salient feature in the after-treatment of salpingectomy. I remember with great distinctness seeing a brilliant operator displaying his dexterity on one such case, when to his horror, and that of every one else standing about, he drew up out of the pelvis, with a flourish, a large left pus tube, and with it, an adherent segment of sigmoid some ten or twelve centimeters in length.

It goes without saying that the repair of an injury of this kind is extremely laborious and time consuming, since the free ends of friable, thick walled sigmoid are more or less fixed in position and difficult not only in approximation, but of suturing as well, and indeed, the shock attendant upon the operation just mentioned, was so great as to result in a sudden termination of after-care within a comparatively few hours, when the unfortunate victim died.

I know of several women who have lost their lives as a result of the *peritonitis* produced by a comparatively slight injury to a deeply seated pelvic sigmoid. Repair is always difficult for the reasons just given, and narrowing of the bowel not unlikely. This accident happened to me a few years since, and after suturing the defect, as well as I was able, I gave my patient what seemed the

best guarantee against the ill consequences of the accident, by making an immediate sigmoid fecal fistula in the left linea semilunaris, at the same time completely obstructing the fecal current from passing down into the damaged gut. This woman made a recovery which was uneventful, except for her disgust when she was confronted by her fecal fistula. This, however, closed spontaneously at the expiration of a few weeks, and now she is in perfect health. No doubt, the after-care of many such individuals would be greatly simplified if this prophylactic measure were more commonly employed.

The amount of *shock*, with allied postoperative disturbances, which followed the removal of pus tubes in other days, is by no means so frequently seen at the present time, and we have at one stroke removed the chief source of postoperative worry by exercising more discretion and a wiser choice in these patients. The after-treatment is made more simple and safe by refusing to operate on these patients as long as there is anything acute, or even subacute in the condition.

I am, at the time of this writing, discharging a patient in point. When she was first sent to the hospital she was in one of her recurring acute phases, being extremely sick with pelvic peritonitis. Our peritonitis treatment was kept up for several days. (nothing by mouth, plenty of morphine, hypodermoclysis, and stomach lavage). Then she remained quiet for several weeks longer until there was no vestige of acute trouble; she was sent home for a period of six months, during which time there was so much anatomic restitution that at the end of the period the operation presented no very serious technical difficulties, neither was there the slightest shock or other evidences of the patient's inability to endure the procedure.

Dr. Simpson of Pittsburgh long ago taught us not to operate on such patients as long as any febrile reaction resulted from vigorous bimanual examination. I go further than this and add to his safe and sane statement, Kocher's dictum that acute abdominal inflammatory conditions render surgical operations difficult and dangerous for a period of *six months* following, or until tissues have become plastic and mobile, with the minimum adhesions remaining.

It was formerly said that these pus tube patients had *hearts* that could not be trusted to stand much. This was no doubt true, inasmuch as heart muscle damaged was merely a part of the general picture which rendered an operation in the acute phase dangerous. It

will be noted by those of much experience along this line, that we no longer see the patients who were selected according to the above rules, become cyanotic on the table, or die with progressively lowering blood pressure a few hours after the operation.

Every one who has made bacteriologic studies of the condition of such tubes, has had occasion to observe the *sterility* of the fluid contained. If the patient is operated on six months after the acute phase has subsided, such an operation may look mussy, provided the thin-walled tube be ruptured, which by the way, is much less likely at the expiration of six months than at any earlier period, still, this accident results in no danger greater than the release of a nutrient culture medium, which is, of course, undesirable in any kind of surgery.

There was a time when *tube plastics* were much indulged in. The conscientious operator, after removing one tube in a young woman, hesitated to sterilize her by totally removing the other, hence anchored the ovary within the mouth of a split open tube. Theoretically, this seemed a most laudable procedure, but there are weighty practical objections to it. An instance in point came up when I was a volunteer assistant at the clinic of Professor Freund in Strassburg. A young woman in apparently good health, walked into the hospital one morning, and was explored the next day. A rather harmless looking hydrosalpinx was the occasion for the removal of one tube, and a plastic on the opposite one. A peritonitis of explosive violence resulted, cyanosis rapidly deepened, and the young woman was dead within twenty-four hours. An autopsy made under bacteriologic controls, resulted in a streptococcus pure culture. It was assumed by Freund that the tube contents had contained virulent streptococci, which had been disseminated at the plastic procedure, and the patient killed in consequence.

In my own experiences of this kind, I have had no such sudden and violent terminations of the after-treatment. I am not sure, however, that some of my few patients of this character would not have been willing to exchange prolonged suffering for the more hasty, although fatal ending of their experience.

In every instance, where a tube plastic has been done, a continued low grade chronic inflammatory process has resulted, with no relief until a secondary removal of the affected tube and ovary has been made.

The subject of *drainage* may not be a vital one here, but it is frequently a perplexing one. I must again confess my inability

to give advice of a general nature about draining patients in whom actually diseased, adherent, fluid-containing tubes other than those of a tuberculous nature have been removed.

As has been noted, the contents of these tubes, after gonococcus or puerperal infection, are almost uniformly sterile, if the approved time for operation is chosen, hence one might readily argue that no drainage is really necessary, even if contents is spilled; still we do not care to leave a good nutrient medium behind, and if we do not succeed in removing it all while the patient is on the table, I am accustomed to leaving a soft rubber drain in the lower angle of the wound for twenty-four hours, or if one cares to engage in a little extra refinement, he may bring it out through a stab wound just lateral to the incision.

There are one or two other reasons why drainage may be used with profit in such patients, one being the possible danger of hollow viscera being wounded at the time. I have just recently had one such case, in which I thought I saw gas escaping during the operation, but could not locate the point, and left a drain behind, but fortunately my suspicions were not substantiated by later developments.

Sometimes wide surfaces are bared of their peritoneal covering, and one feels a bit safer if a drain is left behind to take care for twenty-four hours of the exudate which accumulates prior to the formation of plastic fibrinous adhesions. Possibly we exaggerate the value a drain may afford in these individuals, since we can never know the outcome in the case if no drainage had been used.

There is, of course, one positive detriment where drainage is employed; viz., the profuse escape of peritoneal fluid implies a direct loss for the patient, and a step toward dehydration. Our difficulties in this way are great enough after general anesthesia where no form of drainage is employed, hence we merely add to them if the peritoneal cavity is left open at all.

It seems to me only logical where a patient is being treated for a peritonitis that has been drained, to supplement this maneuver by our peritonitis treatment, of which mention has been made so often in this volume; viz., prohibition of anything by mouth or anus, plenty of morphine, hypodermoclysis and stomach lavage, as indicated by (1) distended stomach, (2) high stand of the diaphragm, shortness of breath, nausea, or vomiting of small quantities, which indicates a dilated stomach with residual contents.

Gauze packing in the peritoneal cavity has no place in modern surgery, provided of course, that the peritoneum is not greatly

changed and there be no really serious emergency confronting one. Gauze in the healthy peritoneum means the introduction of germs without exception. It means, of course, extensive adhesions around it, and if the pack remains in place any length of time, means the great danger of decubitus affecting a hollow viscus, large blood vessels or other important structures. I make only one exception to this prohibition against packing in the pelvis, that is, where the emuculation of a large pus sac has left a wide, raw surface, and the bleeding from this can not be controlled in any other way.

After the pack has been well placed, the continuation of it through the free peritoneal cavity and out the abdominal wound must be carefully and snugly wrapped with rubber dam, so that no adhesions between it and the viscera or wound edges can take place. It goes without saying that the subsequent removal is thus greatly facilitated. Dr. V. P. Blair was the first to call my attention to the fact that a definite rule underlies the removal of gauze from a wound. During the first two days a gauze pack does not become very strongly adherent. Then it remains exceedingly tight in place for the next five days, but after one week, suppuration around it destroys whatever firm contact had been consummated, so that one readily arrives at the deduction, to remove all gauze packs about the expiration of two days when hemorrhage will have ceased, or leave them in place for a full week, after which time, they will come out much more readily.

The after-care of double salpingitis patients is said to be measured by the life of the individual, unless the pathologic anatomy of gonococcus infection in the female is understood. This germ has *four habitats* in the genital tract of the female: bartholin glands, Skene's tubules, the glands of the cervix uteri and the fallopian tubes. If then, the backache, bladder symptoms and leucorrhea, which characterize gonococcus salpingitis, are to be cured, and the after-treatment rendered simple, short and sure, one must not leave behind one of these four infected or potentially infectible areas.

In order that the ideal after-care may ensue, one ought never to simply remove a pair of pus tubes and await the formation of the cornual exudates described above. Suppose one goes a step further and does a supravaginal hysterectomy. The patient experiences one stump exudate instead of two cornual exudates, and has left in place three foci of chronic infection, one of them the cervix, certainly already diseased, and no relief of bladder symptoms or leucorrhea will therefore be experienced. But if he does a total hysterectomy at the same time he removes two gonococcic tubes, his patient will no longer suffer during the after-treatment

from backache, bladder symptoms, or leucorrhœa, unless the Bartholin glands, which can easily be attended to at a second sitting, cause a certain amount of discharge into the vaginal canal.

It is thus seen to be impossible for us to consider after-treatment *per se*, without at the same time making occasional mention of the technic underlying operative details. Badly conceived, or poorly executed operative treatment, surely here, as nowhere else, lays the foundation for distressing and long-continued after-care.

The after-care and prognosis which attend the removal of *tuberculous* tubes, will be vastly simpler if no drain is left in place. The peritoneum of surrounding adjacent intestinal coils, is always tuberculous, and the least pressure continued for ever so short a period, invariably results in a fecal fistula. Even if this unfortunate and practically permanent lesion be not instituted, a tuberculous sinus is quite prone to mark the drain track. A secondary tuberculosis in the abdominal wound is a ready consequence of such a sinus, a matter which has been gone into more fully in the treatment of the tuberculous variety of peritonitis, hence, mere mention is made here.

A woman who has been operated on for a *ruptured tubal pregnancy*, should experience in her after-care, as a salient matter, the treatment of the after-effects of hemorrhage. If the fluid blood found in the peritoneal cavity is immediately mixed with one part to ten of 3 per cent sodium citrate solution, it may be reinfused into a vein as soon as the abdominal wound has been closed. The mixture is allowed to enter slowly, and a certain amount of salt solution must be kept in the funnel so that the fluid level remains high when all clots will be found to float on top of the fluid, and none will gain access to the vein. To make matters doubly sure, a wise precaution consists in filtering the entire fluid mass through gauze which has been dipped in paraffine. This procedure entails no blood matching, and none of the effects of transfusion, which may be, as we all well know, disagreeable for the patient, and now and then dangerous, even in spite of the most careful matching.

Of course, blood transfusion is to be performed in each instance where there has been a marked acute anemia as a consequence of blood lost, provided the above-mentioned reinfusion is not carried out.

If the patient does not die from the primary hemorrhage, the greatest danger resulting from blood in the peritoneal cavity is always *dynamic ileus*. A high degree of paralytic obstruction is sure to follow unless clotted blood, or blood about to clot, be re-

moved from the peritoneal cavity, no matter what the source of hemorrhage. It is only possible to secure an ideal and uneventful convalescence if this be done.

Let us suppose a patient to have recovered from an operation for a ruptured tubal pregnancy, and the abdomen left relatively full of blood. Then the consequent paresis and stasis must be treated along the lines already laid down under the appropriate heading of Ileus.

Medical therapy will do very little good. A *fecal fistula* may tide the patient along if not too much blood is left behind, until a degree of anatomic restitution takes place, but the prognosis is always bad.

The Uterus.—The various *ligament operations*, which tend to correct uterine retrodisplacements, entail certain definite suggestions which must be incorporated in the after-treatment, if this is to give the ultimate degree of satisfaction.

The *position* of the patient in bed is important. It goes without saying that the uterus will more readily remain in its new anteposition and put distinctly less tension on the shortened ligamentous supports, if the patient lies upon, or inclines toward the face.

There are individuals who habitually sleep in the prone position. It is then, not a difficult matter for them to maintain it after a laparotomy, provided only that there be no undue pressure on the wound. Other women, however, have never lain in bed on the face, and seem to find the posture a most trying one. The judicious use of pillows applied to this or that part of the abdomen, chest or neck, very frequently make it possible for a sufferer to accustom herself in a short time to the desired position in bed. Some find it almost impossible to lie flat on the face, and these patients must be allowed to turn partially toward the side, but never be permitted to roll over on the back. I do not remember a single instance in which a patient, who had normal will power and was willing to cooperate with those in charge of her, was not able to remain for days, either upon the face, or in a position which was a compromise between the prone and the lateral.

A very undesirable consequence of the internal Alexander method, or its modifications, is a distressing sensation of pulling in the groin. This occurs where too much tension has been put on these structures, or where the individual is allowed to lie upon the back, with the uterus exerting in consequence its natural tendency to drop back where it was before the operation.

An *inguinal hernia*, single or double, in the female has been produced more frequently than has been reported, as a result of the injured canal being unduly stretched at the performance of what is known as the external Alexander operation. I believe it to be quite possible for the operator to pull down a cone-like projection of peritoneum along with the ligament. As a matter of course, he produces in this way a condition not unlike that which obtains in hydrocele of the round ligament. It is then only a step further for a hernia to form.

The so-called Baldy shortening of the round ligaments, in which they are drawn through the broad ligaments and attached to one another behind the body of the uterus, has an unique, although I believe, rather rare complication. I refer to the fact that the fundus uteri sometimes *somersaults* backwards over the newly attached ligaments, especially where they have been fastened too low down behind, that is, too near the cervical portion of the uterus.

I recently re-operated upon an individual, five years after the original procedure, and was much interested to find the ligaments still very much in their former state, and quite easily identified in the new position which they had occupied for so long a time.

Obstruction of the intestine, although rare after intraabdominal ligament operations, must never be lost sight of as a possibility, if any annular intraperitoneal new opening has been produced in consequence of the operation. As a result, the operator who is possessed of refinement, attempts to make a subperitoneal operation, that is one in which he manipulates the ligament in such a manner that it never takes a direct course through or across any portion of the peritoneal cavity. This complication has perhaps been more common in consequence of the now obsolete ventrofixation, than after any other form of procedure intended to correct uterine malposition.

No consideration of the round ligaments in their relation to surgery, can be made without due thought being given to future *pregnancies*. Of course, no operation, calculated to make pregnancy difficult, dangerous or impossible, can be taken seriously as a legitimate proposition. I know of successful, and apparently, uncomplicated pregnancies following any of the corrective procedures which are utilized today. There seems to be no particular difference in this regard between any of the various methods which employ the ligaments as such, although ventrofixation is said to have produced many unfortunate results, and this can, as a matter of course, not be urged as an objection to vaginal vesicofixation, since this pro-

cedure was originally proposed for women past the child-bearing period, or for those artificially sterilized.

Hysterectomy, although never a matter of vital importance, provided the operation be well borne, makes so marked a change in certain of the physical functions during the child-bearing period that it is never to be entertained lightly, and in no instance should it be proposed without the full discussion of its consequences with the one chiefly involved. It means a great deal to a woman who has no children, to know that she will never have any, and although she may be a mother already, and probably will never care to go through this experience again, still it must be conceded that the loss of her offspring may quite change her attitude toward the disability of giving birth to others. So it becomes apparent to any thoughtful surgeon that this is never a matter to be lightly entertained, or one devoid of unfortunate possibilities.

In much the same way, a woman who has menstruated for many years is not always easily convinced that it means nothing to her for this function to cease. It has become a part of her life, and while she may be able to give no valid reason for its persistence, still, it is like many another life-long habit, one does not give it up lightly.

Suppose, however, a hysterectomy is known to be unavoidable; the least, then, that can be done to prepare the sufferer for her altered physical condition is to prepare her for the fact that she will not menstruate again. Her *mental reaction* is quite different from that which accompanies the discovery on her part that she has been robbed of what may seem to her to have been quite an important periodic activity. The operator may assure her that he has left the ovaries in place, and this is all very well, because no immediate change in internal secretions will take place, with its hot flashes and other nervous derangements, still she will not be happy.

The operator must use his own discretion in informing his patients of the ultimate outcome so far as the ovaries are concerned, but he should at least know that it takes about *six years* for them to atrophy and become functionless after the removal of the uterus. The connection is here not readily apparent, since the ovarian blood supply is by no means profoundly affected when the uterus is removed. The patient may resign herself far more easily to a hysterectomy, if, in the discussion of consequences, it is made clear to her that her marital relations will in no wise be disturbed by the operation, unless an unusual amount of the vaginal vault be removed at the same time. This is the more true, provided that

the operator employs a technic which contemplates the attachment of the various pelvic ligaments, or what remains of them, to the stump of the cervix, or to the vault of the vagina which remains after the removal of the cervix.

A further discussion of the decreased possibility of pregnancy in her own case is of no little value to the woman about to lose her uterus. If she can be convinced that any form of uterine, tubal or ovarian disease has so changed these structures that the uterus remains to her only as a menace, either to reproduction or to herself, she may the more readily acquiesce in the operation and the consequences of it, than if she is left to indulge in the speculation that perhaps she might have given birth to future healthy children, had not her uterus been removed.

A complication of other days attended the use of permanent *ligature material* near to the bladder in the performance of hysterectomy. Following the general rule that all foreign bodies left in the abdomen tend to gravitate into the hollow viscera and be discharged, many of these heavy ligatures found their way into the interior of the urinary bladder and formed a nucleus for stones.

Of course, this was the more certain whenever a portion of the bladder wall happened to be included in the ligature, but many an operator has been surprised at this happening, even when some little distance intervened between the point where silk was applied and the bladder wall itself.

Many a *ligature* has *slipped* off the uterine, the ovarian or some other important pelvic vessel, and led to the most serious of all possible complications. This is much less likely now than in earlier days, since the trend of modern operating is away from mass ligations, since we anchor most pelvic ligatures with a needle, and since we use thinner strands of catgut which bite their way into the tissue, and last, but not least, since we now have a method of sterilizing catgut which confers upon this material physical properties that reduce the tendency to slipping as was so common when we had to moisten stiff strands before we could tie them.

The immediate outlook where a ligature slips off a large vessel is always exceedingly grave, because such patients always lose a large amount of blood when they can least afford to after a major operation, before the cause of the trouble can be diagnosed or means taken to remedy it.

It goes without saying, that the treatment begins by reopening the abdomen and searching for the bleeding point. This is usually extremely hard to find, partly on account of the soiling, and partly

because the patient will often be found to have bled until a reduction of blood pressure leads to spontaneous cessation of hemorrhage under anesthesia. A relapse under such circumstances is, indeed, a matter of the gravest concern. This is minimized, provided the intraperitoneal blood be mixed with 3 per cent sodium citrate solution, in a proportion of 1 to 10, filtered through paraffined gauze and reinfused into the patient's veins.

The *prognosis* will, of course, be better in the future than in the past, on account of the prevailing tendency to blood transfusion in all hemorrhages, still, one must remember that many a patient will succumb in spite of a blood transfusion. In the very nature of things this remedial measure will occasionally be delayed until anemia of the central nervous system has persisted so long that degenerative changes, for which there is no repair, will have taken place.

The author recently saw two transfusions done on an individual who had bled almost to death, one of 500 and the other of 650 c.c. without any effect on pulse or blood pressure being manifest in consequence, and this, although the patient was fully conscious and might have been expected to show some improvement as a result of the treatment.

Infection in and around the cervical or vaginal stump is occasionally seen after abdominal hysterectomy. This was common enough in the author's earlier experience to make him adopt long ago the cautery as a routine procedure, for a division of these structures.

Where immediate suture closure of them is practiced, and the needle is inserted well within the eschar, this complication will prove to be rare. However, one must recollect that every such burned area, though rendered sterile by the heat, has to be cut off from surrounding tissue by what is to all intents and purposes an inflammatory process, hence, there need be no surprise if a considerable amount of vaginal discharge commences a few days after the operation, and lasts for a week or ten days. Unless the patient be warned of this fact, she is practically certain to experience the disappointing reflection that she is still suffering from the discharge which, in her case, may have necessitated the operation.

Another source of vaginal discharge, which has perplexed many a surgeon, comes from overlooked *bartholin glands*, and persists in patients who have had complete abdominal removal of the uterus and tubes for symptoms of which a prominent one was leucorrhœa; with a promise on the part of the operator that this discharge would be a thing of the past. A word to the wise in this connection is sufficient.

Occasionally one sees a *vaginal hemorrhage* come on from one to two weeks after an operation, in an amount which is nothing short of dangerous. This occurs in consequence of the erosion of some fairly large artery, in much the same manner that was well known in the days of hospital gangrene. If the patient is seen early this can be treated successfully by a method of packing, which I have seen employed with the utmost of mechanical perfection by W. H. Vogt of this city. The vagina is held open with a bivalve speculum, and after the operative defect, as well as the vagina, has been very completely filled out with gauze packing, a binder and perineal T-strap are so adjusted that continuous pressure is made by them upon the whole bleeding area.

Injury to the ureter, or perhaps more frequently, inclusion of it in a ligature, is by no means unknown in connection with hysterectomy. This was no doubt much more commonly observed in the operations for cancer done before we learned to freely dissect out the ureter along its entire course beneath the pelvic peritoneum. No doubt, this accident occurs more frequently than is known, since, as a rule, no symptoms of a gross nature are produced where a lesion is unilateral. Total suppression of urine occurs where both ureters are ligated, and if it has occurred in any large measure of cases, the authors of it have scarcely had the temerity to publish their experiences.

The pathology of this condition has been cleared up by a series of very interesting experiments, performed by John R. Caulk of this city. He states, as a result of his work, that tight constriction of a ureter, such as that produced by a ligature led to an immediate atrophy of the kidney. When, however, an intermittent obstruction was produced, the ureter and kidney pelvis dilated, with the formation of a hydronephrosis.

Injury to the urinary bladder, while not so common in pelvic operations performed above, as in those by the vaginal route, are still by no means unknown. They are no doubt more frequent in patients who are the subjects of inflammatory thickening and recent adhesions between the bladder and other viscera, or the abdominal wall. The prognosis in such lesions is not nearly so severe as where the bladder communicates with the vagina.

If a fistula forms, which communicates with the anterior abdominal wound, the track is so long as to tend always toward spontaneous closure, provided of course, that the normal outlet be unhindered.

The treatment begins on the operating table, at the primary sitting, if the accidental wound is discovered then. I have had several

such unfortunate experiences, but in no instance has primary suture of the wound failed to hold. In every such case, a permanent catheter has been left in place for a week or ten days, and the bladder irrigated with an antiseptic solution twice each day. General measures must be undertaken at the same time to reduce extreme alkalinity or acidity of the urine.

Hysterectomy, in connection with gonococcus disease of the tubes and cervix, has been very fully discussed under the section devoted to the fallopian tubes. However, it may not be amiss in this connection to repeat that the *gonococci* thrive in the female genital tract, only in the fallopian tubes, cervix uteri, Skene's tubules, and the Bartholin glands.

It stands to reason, therefore, that the removal of the tubes, even with a supravaginal hysterectomy, can not be completely curative, since the cervix will have been left behind, together with the distressing bladder symptoms (trigonitis and leucorrhea), which originally drove the patient to the surgeon.

Fibromyoma of the uterus is most frequently the cause of surgical operations at the present day, and entails a few special considerations in the after-treatment. It was commonly thought that the heart in individuals so afflicted, was deserving of particular care, in view of the fact that there existed an entity known as myoma heart. As this fact is no longer accepted by gynecologic surgeons of wide experience, it will be given no further mention here.

Pulmonary embolism is perhaps more common after a hysterectomy for fibromyoma than following any other pelvic operative procedure. This is to be expected by the fact that enormous varicose veins are frequently seen between the layers of the broad ligaments. In connection with these growths, thrombi form in such vessels as their circulation is interrupted by ligatures, and it has occurred several times in my own practice that such a thrombus becomes detached in part, floats through the right heart into a large branch of the pulmonary artery, and results in sudden death of the individual under circumstances that are most distressing, and at a time when a certain convalescence seemed assured.

Sarcomatous change is not unknown in a fibromyoma. Unfortunately, this transformation is not easy of diagnosis on gross inspection alone. It happened once to me; a supravaginal hysterectomy had been made in tissue which attracted no special attention as being abnormal. The specimen, when submitted the next day to the pathologist, showed evidences of sarcoma, where it had been amputated. It seemed futile to remove the cervix after disseminat-

ing the growth by cutting through it, hence the patient was allowed to go home at the expiration of the customary hospital period, and I regret to relate that the correctness of the prognosis was borne out by subsequent events.

I now use and advise *cautery division* of the cervix in every supravaginal hysterectomy. Had the method been used in the incident related, it would have been quite feasible, it seems to me, to have removed the cervix at a secondary sitting, since there would have been no dissemination at the primary amputation of it.

In one of my patients a *cervical polyp* was left behind at the time a supravaginal hysterectomy was made for fibromyoma. It continued to grow, and reached such dimensions in the vagina as to necessitate its removal, together with that of the cervix, in order to insure no future happening of the kind.

Pregnancy occurs in such a large percentage of patients in whom myomectomy has been done, that I believe we should consider seriously the circumstances surrounding such patients, before it is decided to do any more radical operation on a tumor, which indicates the feasibility of the more conservative procedure. Surely no youthful married woman not already the mother of children, should be allowed to give up all hopes of progeny, just because the entire uterus has been removed, when the tumor itself might have been shelled out and the child-bearing function preserved.

A study of *cancer of the uterus* involves a number of considerations. Those fortunate patients seen so early that a radical curative operation can be attempted present no features in the after-treatment which differ markedly from the experience gained from hysterectomy in general. However, we see comparatively few of this sort and must admit, either before or after an abdominal operation, that the majority of these unfortunates, where the cervix is primarily affected, can not be cured, and hence, are entitled to any effort on our part which will temporarily ameliorate their condition.

It has long been the practice of many operators in this field, who speak with authority, to *ligate*, if this be possible, the blood supply of the uterus, and thus minimize hemorrhage and foul discharges. I agree with Percy that this is best accomplished by ligating the internal iliac arteries close to the bifurcation on both sides. Very little difficulty surrounds this procedure in a thin woman, but I have often failed to find the arteries at all in a stout individual, especially if she took the anesthetic so badly as to make the retraction of the intestines difficult.

Some form of *vaginal treatment* should be employed to further minimize discharges. The actual cautery or the electro cautery as utilized by Percy, with the hand in the abdomen to control the effects of the heat, and the water-cooled speculum in the vagina to prevent burning its walls, is the most radical means at our disposal. It has given brilliant results in the hands of its author, and is lauded by many who are experienced in its use; still, it is one of those methods which must be duly considered and its disadvantages known before it is recommended in the individual case. It should never, in my opinion, be employed unless preliminary ligation of the internal iliacs has preceded it, because otherwise, the patient usually experiences a terrific vaginal hemorrhage when the cauterized mass comes away.

I have seen rectal and vesical *fistulae* form, within periods ranging from a few hours to two weeks, after the cauterization had been employed by competent men, and while I do not believe that such an accident is at all common, still, every thinking person will readily admit that nothing is more deplorable than to add such a fistula to the already distressing condition of a hopeless cervix cancer patient.

I rather incline nowadays to make use of the *acetone* treatment devised by Dr. George Gellhorn, in these women, either with or without ligation of the internal iliacs. The treatment is too well known to need more than passing mention here, and I shall content myself by saying that the patient lies on the back, with the buttocks elevated, and zinc oxide is smeared on the surrounding surfaces, both skin and mucous membranes. A tubular glass speculum is introduced into the vagina, and after the excretions have been mopped away, enough acetone is introduced to cover completely the cervix or ulcerating growth. After thirty or forty minutes, this fluid is mopped out with cotton, and the vagina lightly packed so that none may later run out and excoriate adjoining surfaces. This treatment tends to harden exposed diseased tissues, greatly minimize discharges, and keeps down offensive odors.

It is in just this type of patient, where hysterectomy has been attempted, that most of the ureteral injuries have occurred. Where infiltration of the parametrium has made the location of the ureters uncertain, operations for the removal of the growth have been attempted, and as a matter of course, injury to one, or even both sides has not infrequently taken place.

In discussing the prognosis in uterine cancer, we must differentiate sharply as to the location of the growth. It is infinitely bet-

ter where the corpus uteri is the seat of the trouble. Women so affected may go along for a period after diagnosis has been readily established, and still be operated on with ultimate recovery. It is quite a different matter, unfortunately, when the growth begins in the cervix. It may make great inroads, anatomically speaking, before symptoms present themselves so severe as to attract the patient's attention.

Sad to relate, much precious time is lost before consulting a surgeon, and most of these patients, at the time we see them, are no longer fit subjects for radical operation. Indeed, many authors on gynecologic subjects go so far as to aver that every case is hopeless before the time that a clinical diagnosis can be made.

The following posthospital instructions are given by Dr. Stuart McGuire to all patients who have had an abdominal section for pelvic disease:

Your wound requires no further attention. If your clothing irritates it, you may protect it with a piece of gauze or soft linen. A comfortable corset may be worn when desired.

On returning home, avoid too much company. Go to bed early and get up late. Lie down for one hour both in the morning and the afternoon. Spend as much time out of doors as the weather permits. Avoid taking cold especially when you first leave the steam heated hospital. At the end of a week begin to take short walks and drives. Increase exercise gradually. Stop as soon as you feel tired. Never go until you are exhausted. Forcing yourself to do more than your strength permits will retard your recovery. Wear your corset.

Going up or down stairs slowly and carefully will do you no harm provided you are strong enough to do so without undue fatigue. For three or four months avoid running, jumping and lifting heavy weights. Resume your household duties gradually, taking up the lighter ones first. The broom and the sewing machine are the last things to go back to.

No local treatment is necessary other than the use of a douche if indicated for comfort or cleanliness. It should be administered in the way it was given at the hospital. A good solution can be made by adding one teaspoonful of lysol to each quart of water. Tub baths are not injurious.

No unusual restrictions are necessary in the matter of diet. It should be generous and wholesome and such as will tend to restore your loss of weight and strength.

The bowels should be regulated as far as possible by natural means, such as water, food, exercise and the establishment of a regular hour of going to stool. Mild laxatives should be used when necessary.

(A) Your menstruation may be somewhat irregular and painful for a time. Keep quiet before, during, and after your next two or three periods. Don't get discouraged as it may take some time for your organs to perform their functions normally.

(B) The operation done for you will stop your menstruation. In other words it has brought about the change of life. This has come to you sooner than to

other women but the condition is the same as if it was the result of age. There will be no more change in your feelings, appearance, or health than was the case with your mother when she went through the same period of life. For a time it is likely you may be nervous, irritable, and have sensation of heat, but this is natural.

For a time you should be under the care of your family physician. He knows all that has been done for you at the hospital and can give you proper advice and treatment.

While at first you must be patient and prudent, must avoid excitement, worry, and overwork, don't regard yourself as an invalid. You are merely a weak woman getting well. The operation has corrected your local trouble and you will soon be restored to good health. Don't talk too much about hospitals and sick people. Don't think too much about yourself.

At your operation the appendix was

Please report your condition by mail at the end of three months. If you are well, the information will help us; if you are not well, we may be able to help you.

CHAPTER LXXVII

THE POSTOPERATIVE TREATMENT OF UROLOGIC CONDITIONS

By John R. Caulk and Harry G. Greditzer, St. Louis, Mo.

The postoperative treatment of urologic cases naturally falls into two groups; namely, the general and local. Since most patients who require major urologic surgery have impaired renal function, the most important issue for the urologist to determine is the renal capacity of the individual. On these findings usually hinges the outcome of the operation. This obtains both in prostatic surgery, where both kidneys are so frequently disturbed by back pressure with its consequent deleterious effects, and also in primary kidney disease where one or both kidneys may be materially disturbed. The appreciation of the importance of kidney function and the institution of measures to correct functional disturbances have done more to place urologic surgery in the realm of safety than any other factor.

Accurate determination of renal function and careful, systematic, preliminary preparation directed toward its improvement, safeguards a patient against postoperative uremia so that at the present time instead of operations on the tract being attended with a high percentage of postoperative uremia, it should be exceedingly rare. One should always anticipate that uremia may occur, and treat the patient accordingly. By that we mean immediately after operation he should be given hypodermoclysis, put on rectal tap, with soda or glucose (the latter to combat acidosis), given water by mouth, increasing rapidly to force water as soon as nausea ceases. By force water is meant at least a glassful an hour and frequently a glassful every half hour. It is found that this feature is at times difficult to carry out, as patients so often object to it; but it should be insisted upon and always administered.

The chief object of the postoperative treatment of such patients is that of elimination. In association, therefore, with the free ingestion of fluids which is directed toward renal elimination, one must pay careful attention to the skin, and by keeping such subjects warm, allow free skin excretion. The bowels should be promptly attended to; it is often wise to give the patient a saline cathartic on the second morning, unless there be some contraindica-

tion. After this the bowels should be kept free by daily catharsis unless they move spontaneously. Should the patient suffer with distention, enemas are required of either the ordinary soapsuds, water and glycerine, oil and glycerine or the concentrated magnesium sulphate enema which, by the way, is frequently a very effective measure in the control of distention. It is our rule not to give enemas after the second stage prostatectomy or after a perineal prostatectomy, unless there are urgent indications, since the site of operation is so close to the rectum that injuries may occur, and emboli may be induced. While these should be rare complications, the patient must be protected from even the rarest involvement.

The diet should be fairly rapidly increased. Usually such patients are on liquids the second day, and the third day, after the bowels have moved, they are put on solid food. This keeps up their strength, protects them against acidosis, and certainly against distention. All of these patients do better if they can be promptly put on solid food.

Urinary antiseptics which were given before operation are at once resumed; at least on the second day these patients should be given urotropine, 10 grain doses three times a day in association with acid sodium phosphate, 20 grains three times a day. It is better to give the two drugs at an interval of an hour in order to insure the best effect.

Sedatives.—It is surprising how infrequently most of these patients require sedatives. After operation it is our custom to give either a quarter grain of morphine or 1 grain of codeine hypodermically. Of course, they must be kept comfortable, and should they need sedatives, they should have them. On the other hand, the dose should be small in order that renal function may not be inhibited. After the first forty-eight hours there should seldom be any necessity for a sedative. Indeed, the average patient receives not over two hypodermics, provided the surgery has been properly done. In case of depression or weakness we have found caffeine, given hypodermically in one-half to one grain doses every four hours, the most beneficial.

One hears much of shock following kidney and bladder surgery. This is a relic passed down from former days, for real shock following such operations should be extraordinarily rare. Shock has license to occur from two things: first hemorrhage, and second excessive surgical mutilation. In nearly 200 cases of kidney surgery and a like amount of prostatic surgery, patients suffering

from shock could be counted on the fingers of one hand, and in all of these cases it has been due to hemorrhage. In kidney surgery if one does not use heavy retraction, and one should seldom have to use a retractor during kidney surgery, except to gently expose some special point, and if one does not pull at the renal pedicle, and if careful in handling the tissue, shock should not occur. Should there be shock, it should be combated according to the standards designated in other chapters in this book.

One of the complications of urinary surgery which the surgeon always must try to prevent is pneumonia. Chest complications following urologic surgery, particularly prostatic surgery, form one of the chief postoperative dangers. Such involvements may be due to hypostasis, anesthesia or to complications due to surgery. With this in view it should be the surgeon's paramount idea to protect these patients against such results. During the operation a careful anesthesia, preferably gas, or often a local anesthesia, will protect them considerably. Chest complications during kidney surgery should be rare. It is observed that in some clinics rib resections during kidney surgery are quite common, and such resections are frequently followed by pleurisy. It is our opinion that rib resection should seldom be done—indeed in our practice it has been done but once in about 200 cases. We believe, therefore, that if the surgeon is careful and unhurried, pleural complications can often be prevented. Hypostatic congestion and pneumonia in old men must be constantly guarded against. In the postoperative care of such patients, they must be moved frequently and not allowed to lie in one position long. Usually they are placed on a back rest immediately after surgery and turned from side to side at least every hour, except at night during sleep. These patients should be up and about in wheel chairs as soon as is practicable. Great care should be taken to protect them from drafts, and the room must be kept at a constant, moderate temperature.

Since many of the prostatic cases are old men who have become set in their ways and accustomed for years to various modes of living, it is extremely important that the usual routine hospital red tape should be lifted somewhat, in order that these individuals should not be crossed. It is extremely important to allow them things that they want. For instance, some hospitals insist on removal of all underclothing. We insist that such individuals be allowed the clothing they have been accustomed to and catered to as much as possible. A good cigar and a toddy which most of them are used to should be given as soon as desired. In other words,

we should endeavor to keep their mental attitude in the best possible frame.

Injuries of the Penis.—Minor injuries of the penis, such as contusions, small lacerations, etc., are treated expectantly with rest, local applications and elevation, by binding the organ against the abdomen. The formation of a hematoma of any extent is an indication for incision, turning out the clot, and closure with a small wick drain in place for from twenty-four to forty-eight hours. Severer injuries, such as gunshot wounds, are treated by free excision of macerated and infected tissue, and drainage. Stab wounds or incised wounds may give rise to alarming hemorrhage, especially if the injury involves either corpora. All bleeding points are ligated and the wound of the corpus closed by suture; if the wound has extended through corpora and urethra, a perineal section may be necessary to divert urine from the healing wound.

Circumcision.—In the infant after circumcision the wound is dressed with flat gauze thickly smeared with sterile vaseline or stearate of zinc ointment, held in place by the diaper and changed frequently. Complications are rarely seen. In the adult, narrow gauze and bandage is tied around the suture line. If the circumcision is clean and approximation is proper the dressing should be kept in place for at least a week and the line of union kept dry. This is facilitated by giving the patient a test tube with its lower end open, so that he may void through the tube and that no urine may leak upon the dressings. In this way most of the wounds are kept perfectly dry, heal quickly, and by first intention. Should infection take place it is then wise to dress the wound daily with wet bichloride packs. Edema of the glans and prepuce calls for a loosening of the dressing and hot soaks to the penis. Hemorrhage is usually controlled by snug dressings, but at times it may be necessary to reopen the wound in order to ligate small bleeding vessels. Infections are well taken care of by removing enough sutures to allow free drainage. The frequent painful erections following circumcision must be controlled at least for several days by the use of bromides (triple) or narcotics, as these erections are responsible for postoperative hemorrhage, edema, tearing out of sutures, etc.

For phimosis, which is associated with a badly infected preputial cavity, particularly if secondary to chaneroid, a dorsal slit should be done instead of circumcision. Postoperative care in such cases should be directed toward cleanliness and the application of heat. After the first day the penis should be soaked in hot water for 10

minutes at a time at least four times a day, since chaneroid is best controlled by heat.

Hypospadias and Epispadias.—Postoperative care in such plastic surgery entails careful attention to the suture line and flaps, which follows the natural surgical principles, and also the careful protection of the suture line against urinary leakage. If an indwelling catheter is present in the urethra, it should be carefully watched and kept clean. Usually, however, in such cases an external perineal urethrotomy should be done in order to shunt the urine and this requires attention to the perineal wound.

Amputation.—After amputation, if partial, the continuous or indwelling catheter may be employed by placing a catheter in the bladder and strapping it firmly with adhesive, or the patient may be allowed to urinate through the stump. Following total amputation or extirpation, an indwelling catheter is usually used and allowed to remain until the urethra heals about it, a period of from seven to ten days. The wound should be dressed according to the usual surgical measures.

Injuries of the Urethra.—The urethra may become involved in any injury of the penis, but the most common injury is rupture, complicating pelvic fractures, falls astride objects, or severe blows to the perineum. Crushing injuries such as occur to miners are frequently of this sort. The injury is usually rapidly followed by extravasation of urine and becomes an emergency. Perineal section should divert the urinary stream from the injured area, while the area involved with extravasation requires free drainage, sometimes amounting to rib-boning of the tissue. These patients are intensely septic and require eliminative treatment as well as stimulation. The perineal wound is cared for as directed under perineal urethrotomy. The other wounds are dressed frequently, preferably with hot wet packs.

Urethrotomy.—Internal urethrotomy which should be done only in the anterior urethra, requires the use of an indwelling catheter (Fig. 375) preferably a large, soft rubber one, for from two to four days. The bladder is irrigated twice daily through this catheter with boric solution 2 per cent, or with bichloride 1:50,000. The first sound is passed after ten to fourteen days. Urethritis is prevented by keeping the indwelling catheter scrupulously clean; but if it occurs, is taken care of by instillations and irrigations. Hemorrhage is well taken care of by the pressure of the indwelling catheter. Epididymitis occasionally occurs and is treated by elevation of the scrotum and hot or cold applications. External urethrotomy

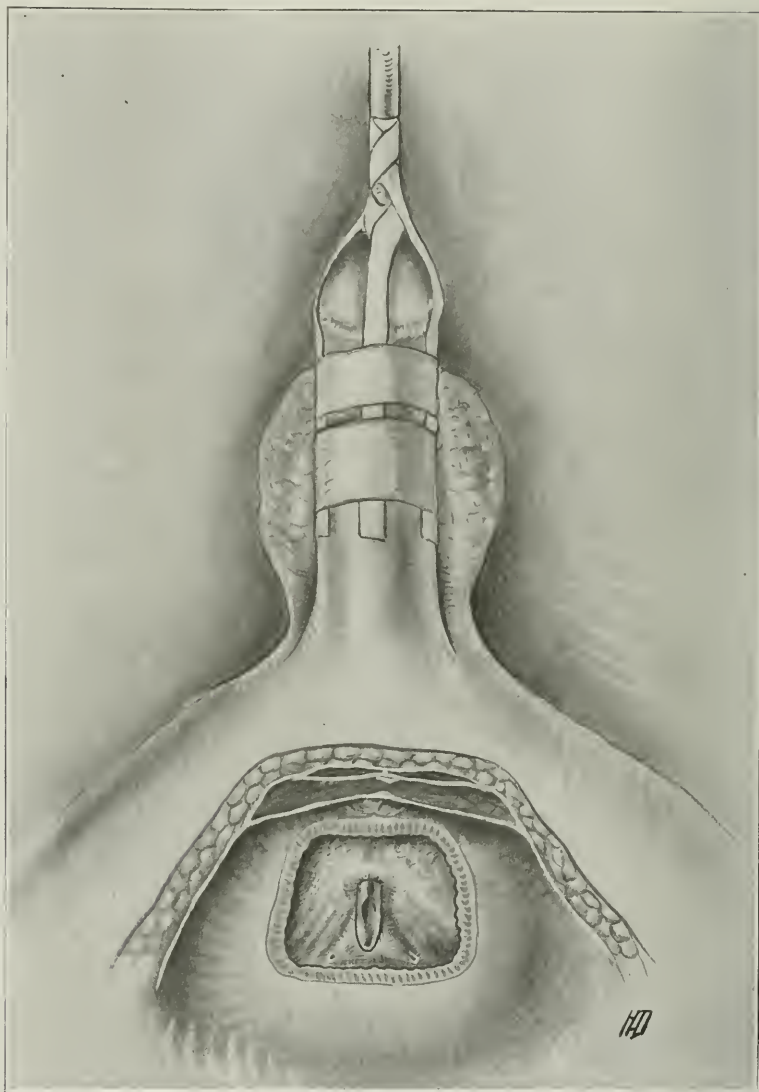


Fig. 375.—Indwelling or retention catheter.

is often complicated by the presence of damaged kidneys and the function must be stimulated by infusions intravenously, hypodermoclysis and tap water per rectum. The perineal tube is removed in seven to ten days and the patient permitted out of bed as quickly as possible. Occasionally the convalescence is stormy, the temperature rising to 103° or 104° , after the operation, after the removal of the tube or any interference with the wound. Under

these conditions recourse is had to general eliminative prescription. The bladder may be irrigated twice daily through the tube if there is any tendency to retention of clots, urine, etc. The first sound is passed about the twelfth to the fourteenth day. Sinus heals from two to six weeks, but after the second week it should be curetted and cauterized with fused AgNO_3 on a probe.

Injuries of the Scrotum.—Lacerated or contused wounds of the scrotum are treated by rest, elevation of the scrotum and local dressings. If the contusion has been severe, a hematoma may be expected, especially if the tunica albuginea of the testicle has been ruptured. This injury may require incision of the scrotum and turning out of the clot and drainage with a wick for several days to prevent recurrence. Severe injuries have been recorded following which ablation of the testicle became necessary because of its condition, but ordinarily an attempt should be made to conserve the organ.

After operative interference in the scrotum the part should be elevated by straps of adhesive across the thigh under the scrotum, and one from the perineum forward over the abdomen. Following phlebectomy or excision of varicocele, the patient remains in bed from seven to ten days to allow readjustment of the circulation. The stay in bed after an operation for hydrocele, etc., is not so prolonged, and the patient should be ordered up in five to seven days.

It has been our policy to insert a small rubber tissue wick after hydrocele resection and to remove it at the end of twenty-four hours. This is done to take care of any oozing which may occur and to protect the patient against hematoma.

After epididectomy for tuberculosis, the wound should be dressed frequently and kept clean. The patient should be placed under the usual hygiene for tuberculosis and promptly put on therapeutic doses of tuberculin. This has been of great aid in the healing of the wounds and in the clearing up of the associated lesion in the vesicle and prostate.

Suprapubic Prostatectomy.—After first stage suprapubic prostatectomy, drainage is accomplished by means of a large rubber tube purse-string in the bladder, or a large sized Pezzar catheter sewed tightly in place. No irrigation is used unless clots or urine fill the bladder causing the patient great discomfort. These can be aspirated through the tube and an intermittent irrigation instituted to prevent recurrence. There are many complex machines recommended for keeping the bladder empty, but these are

entirely unnecessary, as ordinary drainage tubes are all that can be desired. The simple large rubber tube with an eye laterally near the end is perhaps the most satisfactory. As soon as the patient is returned from the operating room the tube is connected up through an L glass tube with a large bottle at the bedside. If the tube causes discomfort, morphine is given or the tube slightly withdrawn, as this is often caused by the pressure of the tube on the trigone or bladder neck. A small cigarette drain placed in the space of Retzius is removed at the end of 24 hours. If the tube is

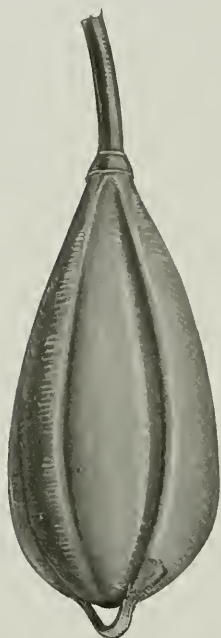


Fig. 376.—Hagner bag.

snug fitting there will be no leakage about it and the dressings will remain dry.

Most of these patients run an elevation of temperature starting their first night, usually around 101° to 102° . This gradually subsides and usually becomes normal about the third day. Should there be much absorption and toxemia, and the temperature range high, the routine measures designated under the first paragraphs of general treatment should be carefully instituted. The second stage should not be performed until the patient is in good condition, the phthalein test good and stable, and the blood nitrogen within safe limits. This may take from one to six weeks.

After the second stage suprapubic prostatectomy, the postoperative treatment differs somewhat as the patient has had an anesthetic. He is not placed on the back rest so soon, but fluids are forced as quickly as nausea ceases, rectal tap contraindicated. Hemorrhage from the prostatic cavity is controlled by means of the Hagner (Fig. 376) or Pilcher bag, a rubber bag inserted into the cavity and blown up with air or water (Fig. 377). This is allowed to remain in place for twenty-four hours and then removed. Care must be taken in removing the bag to disinfect the outlet tube which must

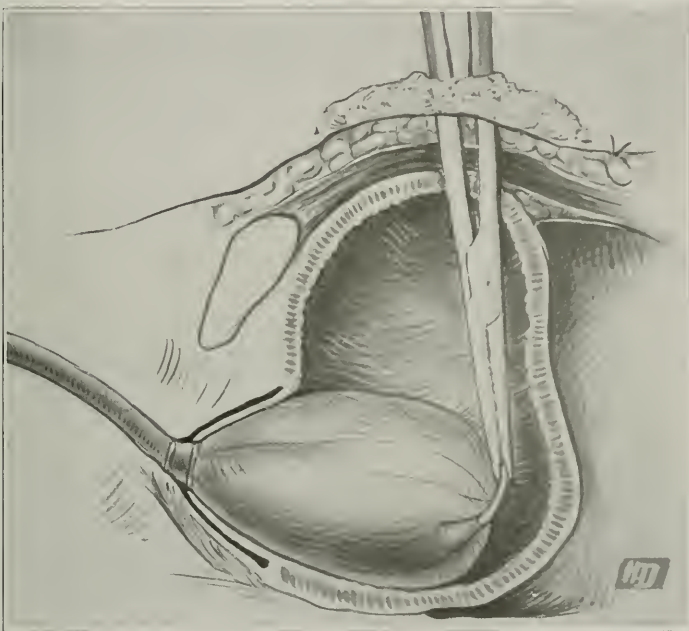


Fig. 377.—Hagner bag in place, with clamp for removal.

be drawn back through the urethra. The tube is thoroughly cleansed with soap and water, washed with boric solution, then alcohol and lubricated with sterile vaseline. The bag is removed through the suprapubic wound by means of a clamp or piece of tape attached to the upper part.

It has been our custom to use no tube drainage following the second stage as the lymphatics are usually blocked and the sinus tract is well formed from the bladder to the abdominal wall, and extravasation and infiltration can rarely occur. Various methods of protecting the upper wound by rubber tissue collodion dressings have not proved satisfactory. We have found that a gauze ring

around the opening to protect the wound from pressure has been a very great help. The suture line should be well smeared with stearate of zinc as well as the skin of the abdominal wall in the neighborhood of the drainage opening. This protects the skin from the constant presence of urine and the wound heals perfectly. Dressings should be changed frequently in order to keep the patient dry. As a rule there is no instrumentation and no indwelling catheter, and almost invariably after the obstruction is removed the patient will void through the natural channel from the tenth day to the third week. It is a wise policy to keep instruments out of the urethra as they usually invite epididymitis and reactions. Usually the wound is not touched, but occasionally the sinus tract needs curetting or cauterizing with silver. Failure of the sinus to close means obstruction at the neck. It may be a lobule which requires removal; occasionally it is a veil-like process at the internal orifice the falling together of tags of mucous membrane; occasionally it is due to spasm of the internal sphincter. If the veil-like membrane is present sounds should be passed, and with a finger inserted into the sinus, the membrane should be perforated and an indwelling catheter inserted. Occasionally the sphincter margin or the irregularities may need removal with a median bar excisor.

Perineal Prostatectomy.—The after-treatment of perineal prostatectomy consists in the care of the infected wound and of drainage provisions. The perineal two-way tube is connected by rubber tubing to a bottle hung at the side of the bed. Dressings are held in place by a perineal T-bandage. No irrigation of the bladder is recommended as it has been shown that the disturbance caused by irrigation and distention is responsible for the washing out of clots from vessels with increasing hemorrhage and embolism. The same results occur from administration of rectal tap. Urine and clots may be aspirated through the tube or washed out with a small amount of irrigation. Gauze packed in the prostatic cavities is removed in twenty-four hours and the perineal tube within forty-eight hours. Renal function is again stimulated as after suprapubic operation and the patient is allowed out of bed on the third day. Continence of urine appears ten to twenty days after the operation. At first after removal of the perineal tube urine pours continuously through the sinus, then comes interval urination, during which the patient holds his urine from one quarter to three hours depending on the tone of the internal sphincter, but notices a marked urgency. In ten to twenty days the perineal sinus closes and the patient again voids per urethram, the first act at times being followed by a sharp rise

in temperature, due to urethral absorption. Some cases require the passage of a urethral sound before the patency of the urethra can be secured. Failure of sinuss closing may mean incomplete removal of obstruction, formation of epithelial lined tract from urethra to perineum or injury to rectum with formation of rectourethral fistula. A general tonic is indicated after prostatectomy and most conveniently given in form of *mixtura gentiana alkalina* or strychnine tablets.

Injuries of the Bladder.—The most important factor in the after-treatment of bladder injuries is the condition of the peritoneum. Injuries complicated by peritoneal tears or wounds are extremely grave because of the peritonitis following. The bladder is repaired and drained, while the peritoneal cavity must be cleansed and drained separately.

Trigonitis or trigonal hyperemia is a condition commonly seen in women, especially those on whom some pelvic operation has been performed. Several weeks or even months after surgery the patient suddenly experiences a distressing frequency or frequent desire to urinate. With this there may be burning on urination, terminal pain, tenesmus or even hematuria. Low backache may be a concomitant symptom. The urine is usually clear.

The cystoscopic examination shows the causative lesion. The anterior or urethral portion of the trigone displays varying grades of vascular dilatation, ranging from simple increased vascularization or arborization to the formation of petechiæ and submucous hemorrhages. These may be discrete or confluent and may occupy the entire trigone. Occasionally epithelial proliferation occurs and plaque-like formations are developed. In extreme cases the trigone may take on the appearance of a strawberry. These cases are treated by instillations of argyrol 25 per cent and AgNO_3 1 per cent to the trigone after catheterization. High dilatation of the urethra with sounds or Kollman dilator and topical applications to these areas through the endoscope are very efficacious.

Litholapaxy.—According to Cabot the postoperative treatment consists in securing free drainage, rendering the urine antiseptic and maintaining an acid urine. Drainage is maintained through an indwelling catheter, through which blood clots, fragments of stone and urine may be washed out. A large rubber catheter strapped firmly with adhesive to the penis is sufficient. Of the urinary antiseptics urotropine or hexamethyl has been found most efficacious. Either is given in sufficiently large doses to produce the desired amount of elimination of formaldehyde.

This elimination depends on the presence of acid urine, so that an acid producing drug such as acid sodium phosphate is administered by mouth or better still bulgara bacilli are injected into the bladder, not only to acidify the urine but also to inhibit the growth of alkali producing cocci and prevent future stone formation. The catheter is allowed to remain in place usually forty-eight hours but longer if necessary, depending on the rapidity with which cystitis clears up. Stay in bed depends on the same factors and absence or presence of complications. Hemorrhage should never be alarming; it is generally well controlled by the catheter. The amount if alarming may necessitate evacuation with a Bigelow evacuator, or even a suprapubic cystotomy. Acute prostatitis, epididymitis and periurethritis are complications often seen; prostatitis is treated by hot rectal irrigations, epididymitis by elevation, and normal horse serum given intramuscularly. Periurethritis is treated with hot applications or incision.

Suprapubic Lithotomy.—Here the maintenance of an acid urine is highly important, as alkaline urine causes phosphatic deposits about the wound and interferes with healing. As suggested by Caulk, the introduction of bulgara bacilli is the most efficient means of prevention and should be continued until the wound is practically healed. Drainage is maintained by a suprapubic drain or through an indwelling urethral catheter and the urine is not allowed to escape on dressings. Confinement to bed generally ranges from four to seven days. Persistent urinary fistula means obstruction below at the vesical outlet.

Cystotomy.—(See Suprapubic Prostatectomy, 1st stage. Treatment is the same except where permanent—cancer).

Injuries to the Ureter.—Injuries to the ureter are extremely common in pelvic operations and should be recognized and repaired at the time of operation. In most cases of wounded or injured ureter after removal of stone, drainage to suture line is indicated in order to avoid results of leakage and to take care of serous discharge. Persistent ureteral fistula should be treated at first by ureter catheter dilatation to attempt to reestablish patency; should this fail nephrectomy or ureteral transplantation is indicated. In case of double ureteral ligation, double nephrostomy should be performed at once to spare the kidneys and later attempts made to dilate and render ureters patent from below by means of the ureter catheter, although it has been clinically and experimentally shown that the ureter will open spontaneously within a period of from six to ten weeks. In the case of single ligation, immediate nephrostomy

will save the kidney. After any operative procedure involving the uretero-pelvic juncture, it is better to leave a catheter in the ureter for several days following the operation. Confinement to bed is usually from one week to ten days.

Injuries of the Kidney.—Many wounds of the kidney alone have been observed by the men in army service, and when not associated with injuries to other organs are not necessarily grave. The torn or lacerated kidney may be cleansed of clot and macerated tissue, sutured and replaced. Fat is often placed in the wound and also sewed over the suture line. Drain is placed to the kidney for several days and the usual surgical dressings are used. Some sub-capsular injuries are generally treated expectantly. The main conditions governing the method of after-treatment are presence or absence of hematoma, shock, infection, etc. In the majority of cases hemorrhage ceases after a short time with local applications to the loin and hemostatics internally. Many of these cases later become infected through old extravasation, and require drainage. Shock is treated according to surgical principles.

Pyelotomy.—As after nephrotomy, blood is expected in the urine for several days. Its absence may mean failure to remove obstruction in the ureter. If urine is discharged through the wound after seven to ten days, catheterization of the ureter should be done to establish patency. It is notable that leakage seldom occurs. The catheter may be left in the ureter several days. Drains to the kidney should be removed in from four to six days, depending on the amount of drainage and absence of urine from the wound. Stay in bed is from seven to ten days. Usual surgical dressings are used with silver foil to protect the skin suture line. Injury to the pelvis of the kidney is not as common as injury to the kidney itself, and is usually complicated by injury of the cortex. The torn or ruptured pelvis should be immediately exposed and sutured with fine catgut. The danger of such injury is extravasation of urine into the perirenal space with consequent infection and formation of abscess. These cases require drainage, often secondary nephrectomy.

Nephropexy.—Following nephropexy it is best to confine the patient to bed for three weeks allowing adhesions to become firm and the kidney to become fixed in the new position. This also provides time for a firm scar formation. Injury to the peritoneum or intestine though very rare requires prompt suturing. These patients are generally very comfortable and may be moved from side to side after the second or third day. Bowels are open on the second day and the diet is increased as quickly as is consistent with the

patient's condition. A small rubber tissue wick is placed down to the kidney and removed in forty-eight hours. The usual surgical dressings are employed with silver foil.

Nephrotomy.—Following renal operations patients have far less nausea with vomiting and distention than after abdominal operations. Drains are removed in three to four days and a small tube is placed for the next three or four days. In suppurating kidneys drainage must be kept up indefinitely. Secondary hemorrhage may occur at any time from the day after the patient is up to ten days later. Packing with gauze may suffice.

Nephrectomy.—The cavity from which a kidney is removed is usually drained with cigarette drains to take care of oozing from small vessels and serum exudations. These drains are removed in two to four days. The more extensive the renal suppuration and infection, the larger the tumor, the longer the cavity must be taken care of by adequate drainage. An especially grave complication is injury to the duodenum with its consequent duodenal fistula. Any injury or tear to the pleura should be promptly repaired by the Mayo method. As advised by the Mayo Clinic, O'Neil has closed the wound tight after nephrectomy for tuberculosis, and has succeeded in keeping it so in 25 per cent of the cases. The rest broke down according to expectation. Sinus from the kidney may become very indolent and require secondary closure.

After nephrectomy for any condition, secondary hemorrhage may occur from sloughing about the renal pedicle and may be single, severe and fatal. Immediate packing with gauze and use of internal and intramuscular hemostatics are effective. Injury to the peritoneum or bowel manifests itself usually on the fifth day and requires immediate suitable surgical treatment. In cases where renal pedicle has been too short or too difficult to ligate, clamps may be left on the vessels several days. These should be very gently removed on the fifth day and every precaution taken to avoid secondary bleeding.

Confinement to bed lasts from ten to fourteen days after any of the usual operations on the kidney, except in nephropexy where a longer stay is indicated. Uremia is combated by measures given in the beginning of the chapter, but it may be well to again emphasize the importance of free water drinking or the judicious use of hypodermoclysis, infusion or rectal tap. Preceding and following practically all urologic operations an attempt is made to disinfect the urine by means of some internal urinary antiseptic such as urotropine, hexamethyl, etc.

Many of the patients require nothing for pain, but when a patient is uncomfortable, there should be no hesitancy about using hypnotics, hypodermatically, after assurance that there is no idiosyncrasy. There is really no type of major surgery attended with more pleasant after-results than kidney surgery; it is rare to see patients on the danger list in a hospital after such operations.

CHAPTER LXXVIII

POSTOPERATIVE TREATMENT OF RECTAL AND ANAL LESIONS

By Francis Reder, St. Louis, Mo.

The after-treatment of any surgical work performed upon the rectum and anus must be carried out with as guarded a vigilance as in any other region of the body.

Although nature has favored this particular region with reparative powers of a character perhaps more potent than those met with in other parts of the body, the fact that it is impossible to obtain an operative field about the rectum and anus free from infection must impress upon the surgeon the great importance of the after-care. Although operations can be performed as safely in this region as any other, it is the subsequent contamination of the wound, an inevitable occurrence, which disturbs the balance of adequate assurance for the patient's life.

The response on the part of nature to surgical wounds of the rectum and anus when proper measures for after-treatment have been instituted is prompt, and healing is just as rapid as elsewhere. It is only when the development of an unfavorable condition in and about the wound is not promptly recognized and properly dealt with, that complications of a distressing nature may arise. Inasmuch as the variety of the operations, particularly the character of their executions, have greatly increased since the aseptic era has been in vogue, it behooves that the surgical work about this region be accorded the most painstaking after-care. Just as cursory examples let us cite the operation for excision of a fistula with immediate suture, an operation frequently performed, or the injection with carbolic acid of a pile, quite a routine treatment. Here are operative procedures that demand the closest after-care, for, should things go wrong, the proper measures for their correction could be promptly instituted and disaster averted. And here let it be said that abnormal conditions must be recognized and understood, lest inflammation and abscess extend into the ischiorectal fossa, or uncontrollable portal infection cause a fatal pyemia.

In carrying out the after-treatment of wounds about the rectum and anus, it is well to consider the part wounded and the wound itself; the former, on account of the function it must perform, and the

latter on account of the responsibility for a good or a bad result. The paramount principle which invites the greatest success in rectal operations is cleanliness. To be able to keep such a wound clean necessitates, not only close attention, but also a willingness to perform the toilet properly. It is not every attendant who is equal to this task, and it is well worth the time to occasionally watch the work of the postoperative attendant to see that such work is done efficiently.

Frequently dressings after a rectal operation are intended to remain for several days, hence great care must be exercised in removing the soiled portion, to prevent dislodging dressings which are to remain. Should this part of a dressing be unintentionally removed, it most likely will have to be replaced. This is usually done with great pain to the patient and is accomplished in an unsatisfactory manner, unless done under the influence of an anesthetic.

It is good after-treatment to interfere as little as possible with a wound during the first few days, when Nature's defenses are as yet only in process of construction. Urgent conditions, of course, must be promptly dealt with, and with the least amount of disturbance. Patients confined to bed with a wounded rectum dislike to be disturbed on account of pain caused by manipulation. Pain is an important factor to be reckoned with in the after-treatment. Its significance is twofold: Firstly, pain lowers the resisting powers of the patient by robbing him of sleep and otherwise upsetting the balance of his normal equation; and secondly, it retards Nature's method of wound repair by interfering with the absolute rest of the part wounded. Good surgical work and proper after-treatment are completely interdependent in bringing to a successful issue an operative measure about the rectum and anus; it is, however, true that a faulty technic has often found a great benefactor in an efficient after-treatment, while a brilliant technic has been prone to suffer disaster through a faulty postoperative management.

The general principles governing the successful postoperative care of surgical wounds of rectum and anus resolve themselves into:

Cleanliness.

Rest in the recumbent posture.

The relief of pain.

The least amount of interference with the wound.

The prompt recognition of infection.

The proper measures for its treatment.

The application of suitable dressings.

Hemorrhoids.—The postoperative treatment of hemorrhoids is first considered because it is the most frequent of rectal lesions subjected to a surgical measure.

Be it the ligation and excision method, the clamp and cautery procedure or Whitehead's method, it matters little so far as the after-care is concerned. It becomes incumbent upon the patient to remain in bed for five to seven days, depending upon the severity of the operation and the condition of the patient. For the first



Fig. 378.—A properly applied T-bandage gives security to the dressings and comfort to the patient. Its application disturbs the patient but little. Dressings can be inspected and changed if necessary, without causing any discomfort to the patient.

A T-bandage to "set" well must conform to the size of the patient. Usually a waist band 46 inches long and 4 inches wide with a perineal band 36 inches long and 8 inches wide will meet ordinary requirements. For a male patient a slit in the perineal band to permit the freedom of the external genitalia will be necessary.

twenty-four hours a hot pack of 1:5000 solution of bichloride of mercury is applied to the anal region. In highly neurotic patients a bag of ice kept in close proximity of the rectum will often give greater relief than the hot pack. Should pain be severe during this period of time an occasional opiate should be administered. After the first twenty-four hours the dressing is changed and a dry sterile pad of gauze is applied. This is allowed to remain for forty-eight hours, unless it becomes soiled or disarranged.

If the pile condition necessitated an operative measure of moderate severity, the bowels should be moved on the third or fourth day. To establish a bowel movement it is well to consider the wounded part. The movement should be soft and its expulsion should be accomplished without effort. An enema of equal parts of castor oil, olive oil and glycerin and amounting to about 6 ounces is slowly injected, either with a hard rubber syringe or with a funnel and tube, preferably in the morning. Preceding the enema by two hours, an ounce of castor oil is taken by mouth—should the patient object to castor oil, another efficient laxative can be substituted. In case a tampon-tube has been placed in the lumen of the rectum, the enema is given through the tube. During the subsequent ac-

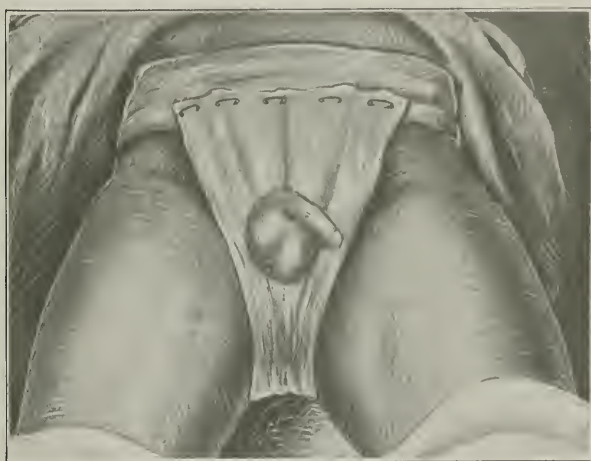


Fig. 379.—T-bandage applied. A correctly constructed T-bandage properly applied, gives the best support to a dressing applied to the anal region.

tion the tube is expelled with the bowel movement. Should the patient be too feeble to expel the tube, the attendant will remove it. Patients may use the commode, except the aged and weak, who should use the bed pan for the first two or three actions.

After the bowels have been moved, the parts should be thoroughly cleansed, a sterile dressing applied and secured with a T-bandage (Figs. 378 and 379). Bowel movements, unless they are voluntary, should be established daily with a laxative assisted by an enema, and the anal region thoroughly cleansed, especially the hemorrhoidal stump, of any adherent feces. The anus is then dressed with gauze and a pad to be secured with a T-bandage, as before. As soon as the slough and ligatures have been east off, the patient is at liberty to go about. This

happens about ten to fourteen days after the operation. In the ligation operation the ligatures become detached about the 9th to 12th day. It depends upon the size of the silk used in making the ligation and also upon the force applied in constricting the pile tumor. It is not good practice to occasionally pull at the ligatures to see whether they have become loosened—allow them to come away without pulling them off.

At this time it is advisable for the surgeon to introduce his finger, well lubricated with vaseline, into the bowel to note whether there is any contraction about the anal orifice. It is a good practice to do this daily for about two weeks. Should the bowel after this time be found somewhat constricted, daily dilatation with a bivalve speculum, or the passage of a bougie, should be instituted to prevent a stricture.

It is well to remember that about the second or third day after the operation an edema about the anus usually manifests itself. This edema, although it is of no consequence, is readily relieved by hot packs of 1:5000 sublimate solution. In some patients an undue irritation in the rectum and about the anus evidences itself, lasting for days. This uncomfortable condition is successfully combated by a liberal anointing of the parts with an unguent of orthoform gr. 10 to an ounce of zinc oxide ointment.

A certain class of patients, especially those of a highly sensitized nature, suffer with retention of urine for several days after a hemorrhoidal operation. Such patients must be relieved by catheter, should other means fail. Frequently when a patient with retention of urine is placed in a hot bath with instructions to pass his urine in the bath, this annoying condition can be overcome. Anything is preferable to catheterization and no trouble should be spared to achieve this end. It is well to bear this complication in mind inasmuch as the evacuation of a distended bladder may afford relief of pain that at first thought might be attributed to an entirely different source.

Tedious ulcerations may follow an operation for hemorrhoids. These ulcerations must be kept well cleansed and treated with a mild astringent ointment, liberally applied. Tannic acid, gr. 20, calomel gr. 30 to an ounce of zinc oxide unguent is an excellent ointment. An occasional application of the fused nitrate of silver, when the granulations appear somewhat exuberant, will hasten healing. Thorough ablution with soap and water after each bowel action and a proper dressing are not to be overlooked.

A complication which may or may not be of a serious nature is that of bleeding. Such bleeding usually follows the clamp and cautery operation, when no tampon tube has been introduced into the lumen of the rectum. Loss of blood may be recognized by having escaped upon the dressings, saturating them. Such bleeding may come on soon after the operation, generally speaking, within twelve hours, and is usually due to mechanical causes and can occur in perfectly healthy individuals.

Another form of bleeding is that characterized by a greater loss of blood, coming on suddenly, and can be justly called a secondary hemorrhage. It can be generally looked for between the fourth

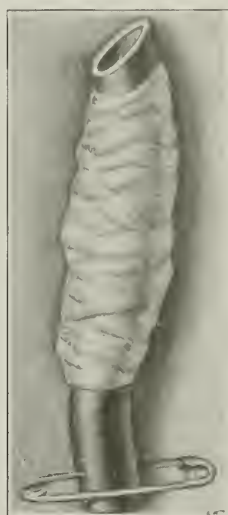


Fig. 380.—Tampon tube. A piece of stout rubber tubing six inches long with a half-inch diameter, wound with gauze. Used to control oozing and at the same time allows the escape of gas. A safety pin is inserted into the protruding end of the tube to prevent it from slipping into the bowel.

and seventh day after the operation, the usual cause being a sloughing or an ulceration in the neighborhood of a vessel. If the operation was the ligation method, the loss of blood may be due to the premature loosening of a ligature. Patients whose constitutional condition has been defective, where the proper healing of the wound has been retarded, are particularly prone to such a mishap and must be closely watched.

The distressing feature about a secondary hemorrhage is that the blood instead of finding exit at the anus and escaping externally, may be retained above the sphincter, and find concealment within

the rectum, only becoming recognizable when the patient presents symptoms of shock and collapse. Should bleeding of a mild degree occur, it can be effectively checked with a gauze-wrapped tampon tube (Fig. 380), anointed with an astringent unguent, or if none should be at hand, with vaseline, introduced into the rectum to a distance of about three inches. This tube should remain in place for at least three days, when it can be removed with a feeling of

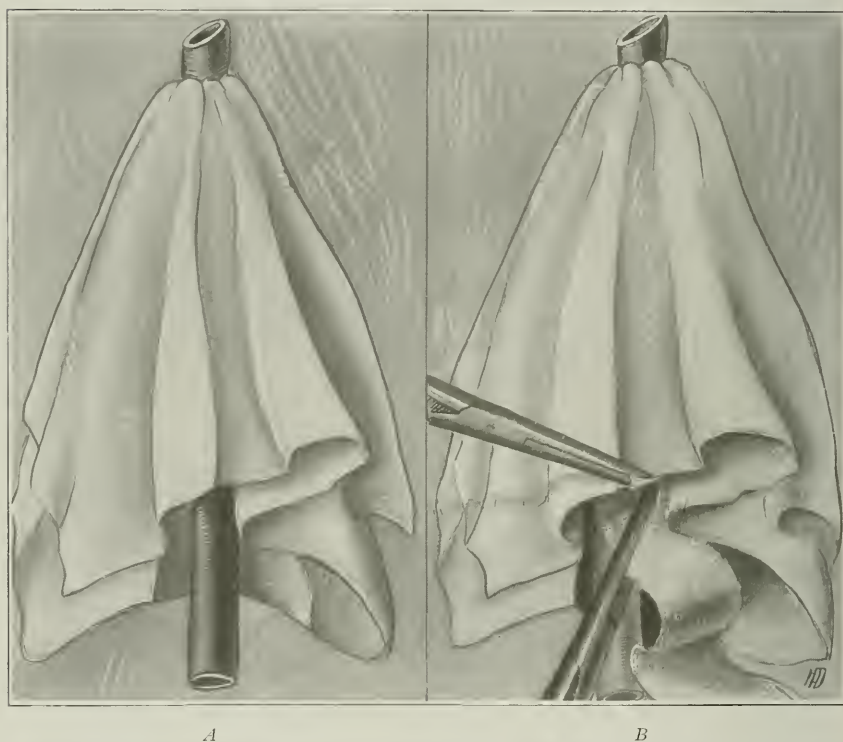


Fig. 381.—*A*. The "umbrella" tampon tube. It is constructed from a piece of cloth or rubber dam 16 to 18 inches square. A hole $\frac{1}{2}$ inch in diameter is cut in the center to admit the end of a stout rubber tube of $\frac{1}{2}$ inch caliber. The cloth or rubber dam is tied to the end of the tube, causing it to flare and giving a closed umbrella effect. The pockets thus formed are packed with gauze or wool so as to exert pressure upon the wall of the rectum. The umbrella tampon tube is used in checking severe bleeding.

B. Showing how the "umbrella" tampon tube is being packed with gauze from a roller bandage.

safety that the bleeding will not recur. It is well to resort to this measure at once instead of losing time by trying out the various minor expedients, such as the introduction of ice or the application of pressure. When the loss of blood has been appreciable and the condition of the patient is bordering on shock, the wound should be subjected to a close inspection in the hope that the bleeding ves-

sel may be found. This should be done with the aid of a proper speculum, a Sims speculum is an excellent one for this purpose, and a good light. After the bowel has been cleansed of all the clotted blood by irrigation with tepid water, and the rectal mucous surface has been brought well into view, it may be possible to discover a spurting vessel. Ligature of the vessel is all that is necessary. However, should the source of the bleeding remain undis-

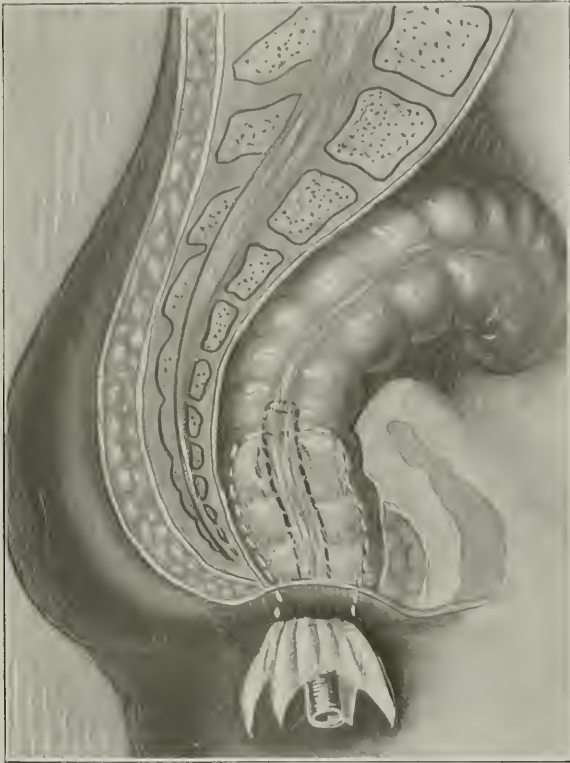


Fig. 382.—Showing the "umbrella" tampon tube in position. The "pocket" is packed with gauze.

covered it becomes imperative that the whole canal of the bowel for about three or four inches be carefully and systematically plugged. This is accomplished in a satisfactory manner by taking a piece of soft cloth, about 18 inches square, a handkerchief will answer the purpose, cutting a half inch hole in the center through which a rubber tube is passed, and the cloth secured by tying it to the tube. The tube should be about 6 to 8 inches long and one-half inch in diameter. This gives a closed umbrella effect. After the

cloth has been well lubricated, this so-called umbrella tampon is inserted into the rectum. The pocket formed by the cloth with the tube in the center is filled with gauze packed sufficiently tight to gently compress the canal of the bowel for a distance of two or three inches. (Figs. 381 and 382.) For this purpose the gauze from a two inch roller bandage will answer admirably. The method is efficient and easily carried out. Such a plug may be allowed to remain for a week. Its removal must be accomplished with great gentleness. No discomfort from the penning up of gas will be experienced as the opening in the tube will permit its escape. An anesthetic may be necessary for the examination and the plugging, in fact if the patient appears nervous it is to his best interest that an anesthetic be administered.



Fig. 383.—Fistulous tracts involving the rectum and anus most frequently met with.

Fistula in Ano.—No matter what the character of the fistula for which an operative measure was instituted, it becomes incumbent on the part of the patient to remain absolutely quiet, and this can only be achieved by rest in bed. Nothing will retard the healing of a fistula more than moving about. If the fistula has been subjected to incision without immediate suture, the factor uppermost in the after-treatment is to guard against the granulations at the verge of the anus to bridge over and adhere, thus leaving a channel below. This may be obviated by seeing that the wound remains properly packed. A dressing placed in the wound at the time of operation should be allowed to remain until it comes away when the bowels act for the first time. This occurs about the fourth day. The bowels

should be assisted in moving with an ounce of castor oil administered a half hour after breakfast. Three hours later a soap and water enema should be cautiously administered.

After the bowels have moved and only a part of the packing has been dislodged, and this is sometimes the case if the wound is a large one and much gauze has been inserted, the remnant must be gently removed with dressing forceps assisted by a well-lubricated finger introduced into the bowel. A thorough irrigation of the lower bowel with a decinormal salt solution or a 5 per cent bicarbonate of soda solution follows. In patients who are irritable a sitz bath should be given instead. After the cleansing is completed the wound is again lightly packed with gauze, a liberal dressing applied to the anal region and secured with a T-bandage.

The first dressing is usually a severe procedure. Patience and gentleness will be greatly appreciated by the patient. In carrying out the subsequent dressings, and they will have to be made daily until the wound is well filled in with granulations, pain can be diminished and the work facilitated by anointing the anal region and the part of the rectum involved with an ointment of orthoform gr. 10, calomel 5, to an ounce of zinc oxide ointment. By introducing a finger well lubricated into the rectum the gauze can be satisfactorily placed into the wound with the aid of a dressing forceps.

If the bowels do not move of their own accord daily, they must be encouraged to do so with an aperient or a gentle laxative. It is not necessary to give an enema daily, however, if it is borne well and does not cause much pain an enema of warm water or a decinormal salt solution is a valuable asset. Soap and water for ablutions of the anal region should be used freely. Care must be taken that the discharge does not pocket, otherwise the edges of the wound will become undermined and lateral channels will form.

The wound must be encouraged to drain freely, and vigilance must not be relaxed until healing has well advanced. Should at any time the granulations appear sluggish, they must be stimulated by applying fused nitrate of silver over their surfaces. If the healing process goes on satisfactorily and recovery is drawing near, the daily dressing of the wound will not be necessary. A close inspection, however, every third day with such gentle packing as the condition of the wound indicates must be continued until healing is complete.

When a fistula has been surgically dealt with and the wound had been subjected to immediate suture, it behooves the postoperative attendant to exercise a close watch over the part for at least a

week. There is great difficulty in keeping wounds in this region aseptic. They are prone to become infected and some part or the whole of the wound will break down and suppurate. The presence of such an infection will cause great suffering. Infection endangering the perirectal cellular planes must be recognized early. Upon such recognition depends the avoidance of graver troubles.

Should digital examination of the rectum, which must be made, reveal a resistant and hard swelling of the wall of the gut in the immediate vicinity of the wound, all sutures must be removed promptly. If with the removal of the sutures the condition does not improve and the swelling seems to become more pronounced, early incision is urgently indicated. It becomes imperative to remove all sutures as soon as any inflammatory evidence, such as redness and swelling, begins to show itself about the anal region. The wound then becomes an open one, and the condition is converted into one similar to a fistula which has not been subjected to immediate suture, only with the addition of an established infection. The after-treatment is conducted on the same lines as that for fistula without suture, the only difference being that the wound is more loosely packed and greater attention is paid to drainage. To facilitate the subsidence of the infection an application of a warm 1:10,000 bichloride of mercury packing and a moist dressing of the same solution to the anal region will prove efficacious. The dressing about the anal region should be changed about every six hours as long as any inflammatory evidence is present.

Patients having undergone an operation for fistula should under favorable circumstances remain in bed for at least two weeks, and then only be permitted to leave their bed when existing conditions give the assurance of a satisfactory result.

Fissure of Anus.—This condition is such a painful one before operative measure has been instituted that the patient after operation is usually in a highly nervous state, and frequently refuses to have the parts inspected. Fortunately the operation for its relief is of a minor nature and requires nothing more than thorough cleanliness. This can be readily accomplished with sitz baths given daily. The dressing placed in the wound is not removed until it is carried away with a bowel movement, or becomes loose of its own accord. No subsequent dressing will be necessary, except a simple gauze protection about the anal region. It is imperative, however, that the parts be thoroughly cleaned after a bowel movement, although the patient may be obstinate. Gentleness on the part of the

attendant will soon gain the confidence of the patient and no difficulty will be encountered in accomplishing the object in view.

The use of a gentle stream of water from an irrigator will sufficiently cleanse the parts for the first few days. Later when bowel actions have taken place and the patient has not experienced any of the severe pains which accompanied an action before operation, the composure of the patient is usually such that a deliberate cleansing with soap and water will be tolerated.

The bowels after the second day should be encouraged to move daily. If obstinate, an oil enema should be given, preferably in the morning. This may be preceded the evening before with a laxative. It is to be emphasized that a soft motion be obtained every morning for at least ten days, so as to prevent the surface from being torn open by a constipated stool. Strict attention to diet will help much in accomplishing this purpose. An ointment composed of orthoform gr. 10, calomel 5 ℥ 1 in an ounce of zinc oxide ointment liberally applied about the anus and up into the bowel as soon as the dressing has come away will be found very grateful. It is well to have the patient remain in bed for at least a week. This method of after-treatment is also applicable to irritable ulcer of the anal canal, frequently found associated with fissure.

Anal Papilloma.—If these growths have been extensive, considerable care in the postoperative treatment becomes necessary. After their removal with scissors the base is usually cauterized with an acid. This leaves an exposed and painful surface, which discharges freely. Comfort of the patient becomes the main requisite until granulations begin to form and the wound shows evidence of healing. To apply a dressing immediately upon the raw surface would cause much pain. Its removal, unless it be soaked off, would be still more painful. For this reason it is advisable to cover the raw surface with a clean piece of rubber tissue and apply the dressing over this. However, a preferable procedure is to take a piece of soft cloth in size a little larger than the wound surface, liberally covering it with an ointment composed of orthoform gr. 10 to vaseline 5 ℥ 1, and apply it directly to the wound. This dressing is to be changed twice daily as long as the discharge is free. When granulations begin to show themselves the dressings are only applied once a day. Ablutions with warm water or steam baths, by allowing the patient to sit upon a bucket half filled with steaming hot water, should be taken daily.

The dusting of the wound with any kind of an antiseptic powder is not to be recommended. The powder mixes with the secretion

and forms small hard lumps. These small lumps cause pain, and hinder in the cleansing of the wound. It is not necessary that the patient be kept in bed after the first week; a certain amount of rest, however, until the wound has healed, is to be insisted upon.

In connection with the after-treatment of the wound resulting from an operation for anal papilloma, it is apropos to speak also of the after-treatment for a hypertrophic form of tuberculous disease about the anus, occasionally subjected to operation. The operative measure for this particular disease is one of excision with immediate suture of the wound. To facilitate the healing of such a wound by first intention the bowels are to remain confined as long as the patient is comfortable, say about a week. The patient is to remain in the recumbent position until the healing of the wound has well progressed. Wholesome food and plenty of fresh air are valuable assets in assisting nature in its reparative process. Should there be troublesome flatulence, it can be inhibited by the administration of 10 grains of salol morning and evening.

Here, as in all surgical work about the anal region, the object is to keep the wound aseptic. Should the wound become infected, it may be necessary to remove all sutures to establish the best possible drainage. Daily irrigations with 1:5000 bichloride of mercury solution should be given and a moist pack of the same solution applied. This method of after-treatment is to be continued until inflammatory conditions have entirely subsided. When the wound presents a healthy granulating appearance, daily dry dressing is all that is required.

If the discharge is scant, a fresh dressing should be applied only after a bowel movement. Ablutions with soap and warm water every second or third day will greatly assist in keeping the parts properly cleansed.

Pruritus Ani.—Pruritus ani is sometimes aggravating enough to demand an operative measure. The operation originated with Dr. Ball and is one of incision and suture. The greatest consideration resting with the after-treatment is the prevention of an infection. The part should be cleansed by irrigating alternately with a 1:5000 bichloride of mercury and a 5 per cent bicarbonate of soda solution two or three times daily and applying a dry sterile dressing. It is well to keep the patient in bed for ten days. A bowel movement should be instituted on the fourth day. At the end of a week the stitches should be removed. If they have been the cause of considerable irritation, they must be removed sooner.

The wound should be closely watched for infectious troubles which might occur. If an infection evidences itself, the sutures must be removed immediately to anticipate graver consequences. The inflamed parts should be subjected to daily irrigation with a warm antiseptic solution and a moist pack applied. When the infection has been conquered, a dry dressing should be substituted for the moist pack. Unless the wound discharges freely, the dressing need not be changed oftener than once a day. After each bowel movement the anal region should be cleansed with soap and warm water, the parts dried in a very gentle manner, and a dry dressing applied.

Should sloughing take place, it is well not to remove the necrosed tissue too hastily with scissors, but to allow nature to throw off the slough. The greater portion of dead tissue, however, should be removed as it lessens the foul odor about the wound. The application of a moist permanganate of potassium 1:5000 dressing will be found serviceable in keeping the wound fresh and clean.

After Nature has converted the infected wound into a healthy granulating one, the treatment resolves itself into the same principles as that governing the care of a simple wound. Keeping the parts clean and well protected, and subjecting them to as little disturbance as possible so as not to hinder the reparative process, is all that will be necessary.

Ischiorectal Abscess.—The after-treatment of an ischiorectal abscess carries with itself a definite responsibility: viz., the possible prevention of the formation of a fistula after the abscess has healed. It is absolutely no reflection upon the after-treatment should a fistula result in the course of the healing, no matter how judicious the management may have been. There is no plan of after-treatment that will prevent the formation of a fistula. It is usually expected that an ischiorectal abscess can not be cured without degenerating into a fistula, and it is well to so inform the patient, otherwise a wrong impression might be gained and the inference made that the subsequent fistula was in some way caused by a faulty technique.

The essential requisite in the after-treatment is to secure free drainage from the opening made during the operation. Dressings must be changed as often as they are saturated with the discharge. For the first four days the dressings may have to be changed on an average of three times in 24 hours. If a tubular drain has been introduced into the abscess cavity, it is well to irrigate the cavity through the drain at least once a day with 1:5000 bichloride of mer-

cury solution or a $\frac{1}{2}$ per cent lysol solution. If rubber dam has been used as a drainage material, the douche point must be introduced into the abscess cavity alongside of the rubber dam and the cavity well flushed. The abscess cavity should be irrigated daily for at least a week and the external parts kept scrupulously clean and free from odor. This can be facilitated by allowing the patient to sit daily upon a bucket filled with warm water. A moist dressing of 1:10000 bichloride of mercury solution should be applied over the involved area and maintained as long as there is marked evidence of inflammation. This may mean a week or more. When granulations are beginning to fill the abscess cavity, loose packing with gauze every second or third day is all that is necessary.

It should be insisted upon that the bowels move daily. Inasmuch as this condition exercises a severe drain upon the vital forces of the patient's body, a wholesome diet must not be overlooked.

Prolapse of Rectum.—No matter whether the prolapse of the rectum has been partial or complete, whether the operative measure has been by cauterization or excision, or fixation, the principle of the after-treatment remains the same. The success of the work depends upon the care that is taken to prevent the descent of the bowel during the early stages of healing, before adhesions have become firm. Although some surgeons omit the introduction of a rubber tube into the rectum for reasons of their own, a properly constructed rectal tube will be found a valuable aid in giving comfort to the patient and rest to the affected bowel. It is an advantage to introduce an "umbrella" tampon tube into the rectum. In explanation of the tampon tube it may be stated that it is a rubber tube a third of an inch in caliber and about seven inches long with a cloth envelope, the whole resembling a closed umbrella.* The object of the cloth envelope tube is to form a pocket into which gauze or cotton wool can be carefully packed at will. The end of the tube, which protrudes about an inch, and the cloth enveloping it, is well lubricated (a mixture of 10 per cent balsam of Peru with castor oil makes an admirable lubricant) and passed into the bowel for about five inches; gauze is carefully and evenly packed into the pouch until desirable pressure is made upon the sides of the involved bowel. If the pressure is uniformly distributed it gives a restful feeling and a firm support to the lower bowel. The patient will not suffer from accumulation of flatus as this can readily pass off through the tube. After seventy-two hours the tube with the packing is removed.

*The tampon tube is described more fully in the section on after-treatment of hemorrhoids.

This can be done almost without pain by first withdrawing the gauze from the pouch and later the tube with its cloth envelope. The parts should be thoroughly cleansed with soap and water and a fresh tampon tube introduced. In introducing the fresh tampon tube gentleness will minimize the pain. It will not be necessary to pack the gauze so firmly into the pouch as during the insertion of the first tampon tube, because the desire to strain will have greatly diminished. With the removal of the second tampon tube dressing, which should take place about the sixth day after operation, it is well to effect a bowel movement by injecting through the tube a mixture of castor oil, olive oil, and glycerin, 4 oz. each. An ounce of castor oil, or some other reliable laxative given by mouth and preceding the enema by two hours, will expedite matters.

When the desire for the bowels to move manifests itself, the tube is removed to relieve any undue strain upon the lower bowel. The patient must not sit or strain while his bowels are moving. The act must take place with the patient lying on his side, and the anus should be drawn up a little from the middle line. This practice should be enforced for about six weeks, according to the severity of the prolapse.

After each bowel action the parts must be thoroughly cleansed and a clean tampon tube introduced. It may be necessary, should the external dressings become soiled, to remove them to allow the parts to be irrigated with a mild antiseptic solution as often as is necessary with the tube *in situ*.

At the end of the second week the tampon tube can be omitted; it is well, however, to allow the tube, gently packed, to remain for another week. A fresh tube should be used after each bowel action. The bowels should be assisted to act every two or three days after the first movement has taken place, which occurs about the sixth day. It is imperative that the patient be kept in the recumbent position for at least five weeks. The foot of the bed is to be raised about eighteen inches and remain raised for at least three weeks. To make certain that the bowels will remain confined, it is advisable to administer seven drops of the tr. opii deod. nightly. A light nutritious diet should be given while the bowels are confined. To prevent the formation of intestinal gases 10 grains of salol administered during the forenoon and afternoon will be of service. However, should the accumulation of gas reach a degree so as to become painful and difficult of expulsion, $\frac{1}{2}$ of an ampule of 1 c.c. pituitrin given hypodermically will usually give relief. Should this dosage of pituitrin fail in giving relief to the patient, a similar

dosage can be given two or three hours later. If a third dosage becomes necessary, it can be administered three hours after the second hypodermic.

Stricture of the Rectum.—Much of the successful outcome of this intractable condition rests with a painstaking after-treatment. Whether the surgical procedure has been a gradual dilatation with bougies or by incision (linear proctotomy), the object of the after-treatment is to maintain the lumen of the bowel sufficiently large to permit of an easy bowel action. If the procedure is by gradual dilatation, success will rest in part on the regularity and perseverance with which the after-treatment is carried out. The relief of the disease requires great length of time and some sacrifices. The first requisite is a set of proper bougies. There are some bougies on the market which are very good and some that are very poor. A vulcanite bougie about 8 inches in length, with a slight uniform taper from base to apex, having a conical end and graduated in size from 1 to 12, is a suitable instrument. The diameter at the base should increase regularly from $\frac{1}{4}$ inch in No. 1 to $1\frac{3}{8}$ inches in No. 12, while the apices have a diameter respectively of $\frac{3}{8}$ inch in No. 1, to $1\frac{5}{16}$ inch in No. 12.

In introducing these bougies it must be borne in mind that they are to be passed with complete absence of violence. During the passage of a bougie, steady pressure against the stricture must be maintained as long as the patient can conveniently bear it, which may be somewhere between a few minutes and an hour.

To facilitate the passage of a bougie an injection of warm olive oil one hour prior to the use of the bougie should be given. The oil has a soothing influence upon the affected bowel and has a tendency to allay irritability during the passage of the instrument.

The most comfortable position for the patient will be upon his side with one knee drawn up. A bougie suitable for the occasion is oiled and the introduction carried to the point of extreme tolerance and allowed to rest there for a length of time governed by the patient, a few minutes to an hour. The bougie after having been used for a few days will be found to pass with ease. The next size should then be taken into use and the dilatation continued by constant perseverance daily, tri-weekly, then bi-weekly and then weekly until the stricture is fully dilated, or at least the condition so benefited as to permit the patient to have a comfortable bowel movement. Liability for the return of the contraction is great and must be kept in check by the occasional use of a large sized bougie.

In case the stricture has been subjected to an incision, the wound is kept clean by irrigation with sterile water or a $\frac{1}{10}$ normal saline solution, and the anal region is kept well cleansed with soap and water. The discharge is often very profuse and inasmuch as there is little or no control over the feces, additional care is necessary in keeping the parts clean. About ten days after the operation the passage of a bougie can usually be undertaken. It is far better to begin the use of a bougie as early after the operation as is possible. It causes less pain and less trouble to prevent contraction than to overcome it after it has once started.

The bougie should be passed daily until the wound has healed, and then at increasing intervals. After the patient has become tolerant to passage of this instrument, the subsequent method of the treating of this condition is the same as that of gradual dilatation. There is one difference, however, viz., greater gentleness and perhaps greater perseverance must be exercised in meeting the whims of the patient who has been subjected to a proctotomy.

Excision of Rectum.—When the condition for which excision of the rectum is performed is taken into consideration, it can readily be inferred how painstaking must be the after-treatment to give to the patient the best possible chance for recovery.

It does not make much difference what route the surgeon has chosen, the procedure in itself is one of great magnitude and taxes the patient's resources to the utmost. Such a patient is in need of the most watchful attention after the operation is completed until the danger period has been passed, a time difficult to reckon.

Inasmuch as there is frequently considerable loss of blood attending the operation, and the resistance of the patient generally poor, no delay should ensue in giving the patient from 20 to 30 ounces of saline solution either subcutaneously or intravenously. Should shock be present, means must be taken to combat it. The application of heat to the body is one of the essentials and must be carried out in a thorough manner. The placing of one or two bags of hot water to the feet does not answer the purpose. Bags and bottles filled with hot water must be placed about the body of the patient wherever a convenient place can be found for them. These bags and bottles must not be allowed to get cold but must be replaced as soon as the water begins to cool. No relaxation of this duty should take place until a definite reaction has taken place.

In the more serious cases the foot of the bed should be raised about 20 inches and should remain raised until the patient's circulatory balance has been restored.

Morphine in $\frac{1}{6}$ to $\frac{1}{4}$ grain doses can be administered hypodermically to relieve pain in six to eight hour intervals for the first twenty-four hours. After the elapse of that time it should only be given when absolutely indicated. Strychnine gr. $\frac{1}{20}$ to $\frac{1}{40}$ given hypodermically every 8 hours during the first 72 hours will greatly assist in relieving the depression from which the system suffers. In the more serious cases where the pulse gives evidence of impending danger, digalen 10 to 15 drops should be given intramuscularly and repeated every four or six hours until evidences of a favorable change become apparent.

The wound must be kept clean and free from discharges. This is best accomplished by frequent irrigations, two to three times daily during the first week following the operation with an antiseptic solution. It is well to use alternately a decinormal salt solution, a 1:10000 sublimate solution and a 5 per cent bicarbonate of soda solution for irrigating purposes. After the third day following the operation a gentle ablution with soap and water of the anal region should be undertaken. This procedure should be carried out daily, especially after the bowels have started to move. The light packing which is introduced into the wound cavity, principally to check bleeding, is removed with the aid of a gentle stream of water from an irrigator forty-eight hours after the operation. If the patient appears weak but otherwise in good condition, the gauze packing may be allowed to remain for ninety-six hours or even longer if the odor is not foul and the general condition of the patient satisfactory. Inasmuch as the wound in some cases is a large one, no subsequent packings will be necessary. With the patient lying on his back or on his side, the head of the bed raised, drainage is usually good. It will not be necessary to irrigate the wound cavity to its utmost recesses for the first week, all that is necessary is to keep the lower part of the canal, the wound, and the anal region clean. Beginning with the second week, it is well to thoroughly flush the recesses of the wound with an antiseptic solution. A $\frac{1}{2}$ per cent lysol solution, a decinormal saline solution, and a 1:5000 bichloride of mercury solution used alternately will prove serviceable. This should not be done oftener than every third day, unless an elevation of temperature indicates that absorption of the secretions is taking place, when a daily irrigation must be resorted to. After irrigation of the wound and anal region the parts are dried and a proper dressing is applied. This dressing should be well secured with the right kind of a T-bandage as it adds much to the comfort of the patient. The dusting of the parts with an antiseptic powder,

such as boric acid, aristol, or the subiodide of bismuth, has no particular advantage and often tends to increase the difficulties in keeping the parts clean.

In its place, should indications call for it, a liberal anointing of the anal region about the wound with zinc oxide ointment or vaseline has at least served the purpose of allaying the irritability about the parts and protecting them from the galling action of the discharge.

If the patient has been reasonably comfortable, i.e., free from troublesome flatulence, the bowels should be moved about seven days after the operation. In case of much intestinal distress, the bowels may be opened on the fourth day. The bowel movement should be encouraged by giving a half ounce of magnesium sulphate by mouth, followed two hours later by a warm enema of castor oil 4 ounces and olive oil 4 ounces. The patient should be instructed not to strain and should be given every assistance that this function may be performed with the least amount of excitement. Unnecessary moving of the patient is to be avoided, and proper assistance should be proffered when placing the patient upon the douche pan. Such patients demand the best possible comfort. They are entitled to it. After a bowel movement has once been established, an aperient should be given every other day to facilitate an evacuation. It is very important that the stool be soft, especially in those cases where the sphincter has been preserved and sutured. If the patient has difficulty in emptying his bowel, the cause should be ascertained by gently inserting the lubricated finger into the bowel. If hard fecal matter be present it must be softened by an oil enema, or a soap and water enema, before evacuation is permitted to take place. After the patient has passed his stool the bowel is carefully washed out by gentle irrigation. For this simply warm water will answer.

It can not be emphasized too strongly that great care must be exercised to prevent contamination of the wound when the bowels act. Although it is not possible to keep these parts wholly free from bacterial invasion, much can be accomplished by cleanliness thus keeping the activities of the harmful microorganisms greatly in check, thereby assisting the cellular elements in building up their defenses.

At the end of three weeks the convalescence of the patient having pursued a favorable course, it is well to examine the rectum for stricture. If any evidence of narrowing manifests itself, a bougie of appropriate size should be introduced and subsequently passed

every other day to prevent further contraction. It may be necessary to have recourse to the passing of a bougie at intervals of a week for many months after the operation.

The length of time a patient should remain in bed depends to a great extent upon the general condition. It is imperative, however, that no permission to leave the bed be given before the deep part of the wound is sound and the surface portion is granulating. In those cases where the sphincter has been preserved, incontinence of



Fig. 384.—Showing gauze packing introduced into the wound after excision of the rectum by the sacrococcygeal route (Kraske). The upper portion of the wound is partly closed by two sutures. In these wounds drainage is the key-note to success.

feces and flatus is at first absolute. After a period of about ten to twelve weeks, however, some control over the anus returns. Where the sphincter has been sacrificed only a very weak control from the remaining anal structures can be expected. This is the class of cases that must be watched closely for stricture formation.

Another class of cases prone to developing strictures and which must be given close attention, are those in which a circular suture of the bowel has been employed. As soon as an undue contraction

is discovered, a dilator should be carefully passed. The size of the dilator should be gradually increased.

Certain operative procedures for the excision of the rectum are especially prone to general septic infection, necrosis of the sacrum, prolonged suppuration, and through the giving way of stitches to the formation of a fecal fistula.

A trauma of unusual severity is excision by the sacrococcygeal route (Kraske). Much of the success of this operation rests in the



Fig. 385.—Excision of rectum by the sacrococcygeal route (Kraske), showing clamps upon blood vessels. These clamps are not removed. They are wrapped in gauze in a very liberal manner, that pressure necrosis of the soft parts with which they come in contact will be averted. After 48 hours the clamps are opened and 4 hours later removed. The additional 4 hours in which the clamps are allowed to remain in a released state is a precautionary measure against any bleeding that may follow. Should bleeding from a vessel manifest itself after the clamp has been released, immediate locking of the instrument will usually secure the vessel, inasmuch as the clamp has been shifted but little from its original position.

after-treatment. The nature of the wound invites septic infection, and unless such an infection is duly anticipated, embarrassing sequelæ may seriously retard the recovery. During the operation it may become necessary to hasten the work on account of the poor condition of the patient, and clamps applied to vessels will be allowed to remain, thus saving the time otherwise taken up for ligating. With these clamps in position and the wound well packed with gauze, the whole secured by a proper bandage, the patient is returned to bed. (Figs. 384-387.)

It is here that the important part of the after-treatment begins. The patient will have to be kept lying on his side. He must remain absolutely quiet and must be assisted in doing so by the administration of opiates. A quarter of a grain of morphine hypodermically followed four hours later with 10 drops of tr. opii deod. by mouth for three or four doses given at intervals of six hours is a

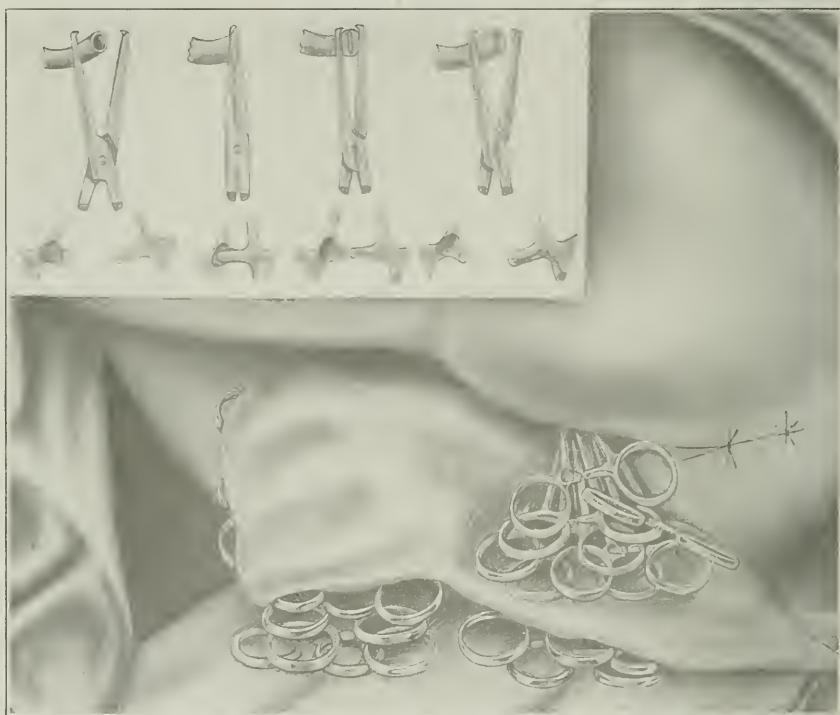


Fig. 386.—Showing position of patient when returned to bed with clamps securing the blood vessels. A restless patient can readily harm himself either by causing one or more hemostats to become released and causing free bleeding often troublesome to check, or by poking the instruments deep into the wound with the likelihood of inflicting trauma to adjacent structures. A proper vigilance over the patient is imperative. He must be assisted with opiates to remain quiet. The insert shows the character of the clamp used in this operation.

satisfactory procedure. Forty-eight hours later some of the gauze is removed with great gentleness and the clamps are opened but not removed. The wound is lightly repacked, and four hours later the clamps are removed with the most gentle manipulation with as little disturbance to the gauze packing as is possible.

If a sacral anus has been formed and a large rubber tube inserted into the bowel (Figs. 388 and 389), an efficient evacuation can be obtained by introducing an oil enema composed of castor oil, olive



Fig. 387.—Showing patient in bed lying on his side. A suitable bandage properly applied, gives the necessary protection to the wound, harboring the clamps which were allowed to remain on the blood vessels. For the comfort of the patient a round pillow has been placed under his knees. The bandage shown in the illustration is made from cheese cloth, is four layers thick, 8 inches in width, and 12 feet long. It is undoubtedly the most serviceable bandage for these cases.

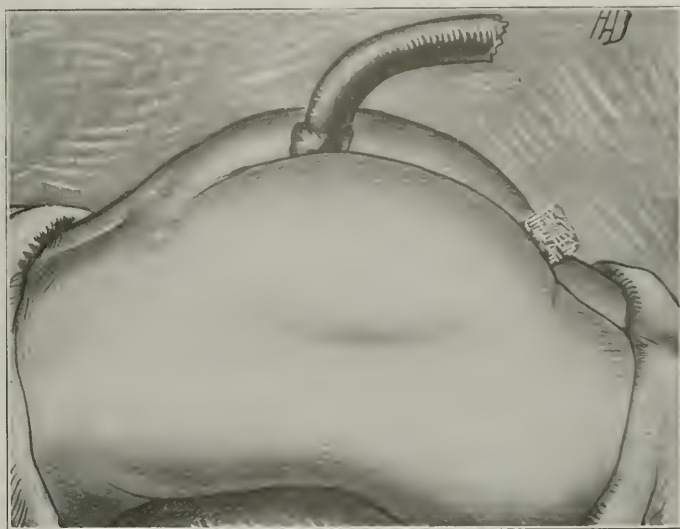


Fig. 388.—Excision of the rectum by the sacrococcygeal route (Kraske) with sacral anus, showing large rubber tube inserted into the bowel. The diameter of the tube should be no less than $\frac{3}{4}$ of an inch to obviate some of the difficulties encountered in keeping the wound clean after bowel activity has been established.

oil, and glycerin, each four ounces, into the bowel through the tube. This should be done on the fourth day after the operation. It is advisable that daily actions follow, and unless they occur voluntarily, they should be encouraged with a stimulating enema supple-

mented by laxatives. A saline during the first and during the second week after the operation should receive preference.

As healing of the wound progresses and the tissue defenses become better organized, the tube in the bowel can be removed. It is advisable, however, not to remove it too soon, as increased difficulties in keeping the wound clean may be invited. However, much depends upon how the tube has been secured in the bowel. Ten to fourteen days is the usual time for a tube to remain in place, and after the elapse of this time the patient will be in a better condition

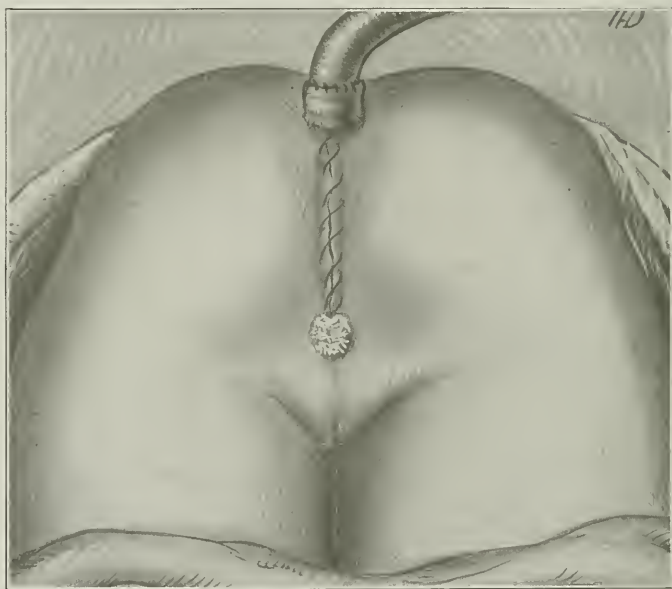


Fig. 389.—Excision of the rectum by the sacrococcygeal route (Kraske), with sacral anus in the upper angle of wound and gauze drainage in the lower angle. The intermediate portion of the wound has been closed with suture.

to handle himself, and the parts will be in a condition to permit cleansing without much difficulty.

These are some of the complications with their attendant dangers which are met with in this character of surgery. The sooner they are recognized during the after-treatment the more hopeful will be the outlook for the patient. These complications must receive the attention their character demands. The after-treatment conforming to the individual condition will be found in detail in some of the preceding chapters.

Patients having been subjected to a serious operative measure about the rectum should frequently be fed with small quantities

of nutritious, easily digested food. Water in small quantities should be freely given.

Rectovesical Fistula.—In every form of fistula absolute rest after the operation is the greatest contributory factor to success. Inasmuch as the operative measure for the cure of this affection is a very definite one and frequently extensive in its scope, the after-treatment embodies all of the principles applied to the care of rectal wounds. It becomes imperative that after the operation the patient should be kept in bed and placed in the prone position, i.e., face downward. This position should be maintained for at least seventy-two hours unless there should be good reasons for a change. It is well to elevate the hips by placing a pillow under them. If this should prove uncomfortable, elevating the foot of the bed about 18 inches will answer the purpose.

For the first forty-eight hours a catheter should be kept in the bladder. If the case has been an unusual one, it is advisable to allow the catheter to remain as long as ninety-six hours. In fact it may be necessary to allow the catheter to remain for a week or ten days. The catheter must be removed daily for the purpose of cleansing. This is done by washing with soap and hot water, forcing a stream of water through it, and then boiling. Two catheters should be on hand so that one may be introduced immediately upon the removal of the other. It is important to maintain the acidity of the urine during the healing process. This can be best accomplished by the administration of urotropin gr. 5 in a glass of water morning and evening, or by a solution of boric acid gr. 5 and benzoic acid gr. 5 to a half glass of water given three times daily. At the same time diluents should be freely given to render the urine less irritating. A daily 3 per cent boracic acid irrigation of the bladder is to be employed for a week to ten days. After the first seventy-two hours in the prone position have elapsed, the patient is permitted to turn on her back. In this position she is to remain with hips elevated for the greater part of the time and, if possible, preserve this position until the sutures have been removed, which is about the ninth or tenth day.

An additional service in the after-care, which has much bearing upon the successful outcome of such an operation, is the attention given to the rectum. It becomes absolutely necessary not to allow the lower portion of the rectum to become distended with gas, lest the tension upon the operated part prove detrimental to its healing. To avoid a gas collection a tube wound with gauze and well lubricated should be introduced into the bowel and permitted to re-

main four or five days. This tube not only permits the escape of gas and liquid fecal matter, but it also puts at rest the lower rectum, an item of considerable value when minor details mean so much in the after-treatment.

About the fourth or fifth day the bowels should be moved. This is preferably accomplished with a saline or a dose of castor oil given by mouth. The rectal tube is removed as soon as the desire for the bowels to move becomes evident. This is done to minimize the effort of straining.

An enema is to be avoided in establishing the first action for fear of distending the bowel and causing disaster to the part operated on. The introduction of liquids into the bowel to induce an action is only permissible when there is evidence of a hard stool. Under such conditions the enema should be in the nature of an irrigation. For this purpose, two rectal tubes are to be used, one to allow the liquid to enter the bowel, the other to carry it promptly away. This irrigation with warm water is to be continued until the stool has become softened. To further facilitate matters six ounces of olive oil can be instilled into the rectum after the irrigation. The initial action having been established, a bowel movement should be insisted upon every other day for at least three weeks. The diet during the first week should consist of such food as will leave little residue. During the first four days following the operation it is admissible to administer an opiate morning and evening, preferably *Tr. opii. deod. gtt. 7* by mouth, to insure rest, a factor necessary in dealing with this condition. The patient is permitted to leave the bed at the beginning of the third week.

Rectovaginal Fistula.—The operative measures for this lesion are manifold, nevertheless no matter what the surgical procedure, the one great factor in the after-treatment is rest in bed with the abolition of all resistance to the passage of gas and fecal matter. A rectal tube wrapped in gauze introduced into the lower bowel will be a proper vent and allow the gas and liquid stool to escape. At the same time it will exert a gentle pressure upon the bowel wall, a great benefit in some operations for this lesion.

The vagina should be loosely packed with gauze. After forty-eight hours the gauze in the vagina is removed and a douche of $\frac{1}{2}$ per cent lysol solution given. Douches are to be given morning and evening for about ten days. It is advisable to change the character of the douche; viz., the douche in the morning should consist of $\frac{1}{2}$ per cent lysol solution, the douche in the evening of a normal saline solution. The following day the morning douche

should consist of a $\frac{1}{2}$ per cent lysol solution and the evening douche of a 1:5000 bichloride of mercury solution. Occasionally a sterile water douche should be given. The amount of the solution used for a douche should be two quarts. On the fourth or fifth day the tube is removed and the bowels are encouraged to move. This procedure should be followed as outlined under the after-treatment for Rectovesical Fistula.

Sutures are removed on the ninth or tenth day, and the patient allowed to leave the bed between the fourteenth and twentieth day.

Complete Tear of the External Sphincter Ani.—This injury which happens in a complete laceration of the perineum is one that demands extraordinary attention after surgical restoration. The damage is usually done when the initial bowel action is taking place. It is advisable that the patient be removed from her bed to a dressing room and placed upon a table when it becomes desirable to move the bowels. Specialists who have been particularly successful in this work insist on a movement forty-eight hours after the operation. A saline is administered by mouth, and an hour later an enema of sweet oil is given. When the desire for defecation manifests itself, the patient, with the buttock resting upon a Kelly pad, is turned on her left side and instructed not to strain. With the left hand pressure is made toward the new perineum, while the right hand carefully opens the anus. With this assistance the patient performs the act of defecation. Should there be any difficulty an additional enema of soap and water is given, and in this manner the bowel is encouraged to move. A thorough action should be insisted upon. This is followed by a thorough irrigation with a 1:5000 bichloride of mercury solution. The parts are dried, a sterile pad is applied and the patient is returned to bed.

After the first movement the bowels should act every second day, assisted by a laxative or an enema.* On the eighteenth day the patient is permitted to leave her bed, and if all has gone well she should be aware of retention power.

*Precautions should be taken when subsequent bowel movements take place. It will not be necessary to remove the patient from her bed; an attendant, however, should be present to give such assistance as may be required. Above all the patient must be cautioned not to strain.

CHAPTER LXXIX

THE AFTER-TREATMENT OF OBSTETRIC AND VAGINAL OPERATIONS

By W. H. Vogt, St. Louis, Mo.

General Consideration.—The after-care of a patient operated during pregnancy, whether that be to interrupt pregnancy at a premature date or whether the operation is done for delivery at term, or for some abdominal or pelvic condition existing in conjunction with the pregnancy, is in a general way the same as the care given any patient after surgical operations. There are, however, a number of things which must be considered separately, for conditions arise after obstetric operations with which the average general surgeon is not familiar. The general surgeon, with a good technique, can do a Cæsarean section perhaps as well, or better, than the obstetric surgeon. But does he know what to do with the patient after he has operated? Does he know when to place the babe to the mother's breast, or is it advisable under the circumstances to place the child to the breast at all? Does he know about the proper involution of the uterus and the genital tract in general? Does he know about the lochia? These, and many other important questions must be answered, and the conditions coped with in the postoperative obstetric cases. It will therefore, not be amiss to explain a few of the essential things under a general consideration. In the after-treatment of these cases, we have two individuals to consider, the patient and the child. It is all very well to state that the mother must under all conditions receive first consideration, but we must not forget the babe. Naturally, the babe does not come in for any special surgical after-care as a rule, except in cases of injury produced by the method of delivery, but the mother and family are anxious about the child and unless we are able to give the mother every possible care, we are not going to be able to give the child the chance of life which it should have.

The old saying that the fate of the patient is decided on the operating table, may hold good for many operations, but certainly not for laparotomies or for the cases operated during pregnancy for purposes of delivery or otherwise; for here only a part of the work is completed; a not unimportant part still remains to be done in the following days after operation.

Before taking up the treatment after special operations, a review, as practiced by the author in cases generally, will be discussed.

Nutrition.—If a general anesthetic has been used and vomiting follows, it will, of course, be necessary to allow the patient nothing per mouth, not even water. In obstetric operations which are so often emergency operations and must be done, in many instances, when the patient has only recently completed a large meal, it is always well to do a stomach lavage before and after giving the anesthetic. If vomiting ceases or greatly subsides, small amounts of very hot water and if this is well tolerated then cracked ice or cold tea in teaspoonful doses frequently repeated may be given. The systematic rule, followed by some surgeons, not to allow any fluids to enter the stomach for twenty-four or even forty-eight hours works an unnecessary hardship on the patient. Before the vomiting has ceased or immediately after the patient has been brought from the operating table to her bed, the use of protochloride of 500 to 1000 c.c. of normal saline solution 108° F. will aid greatly in relieving the very annoying thirst. After this, strong coffee may be given which occasionally acts as a valuable stimulant. The first food given should be milk in teaspoonful doses and the amount gradually increased as the stomach becomes more tolerant. Egg albumen is a nourishing food and can be given in one or two teaspoonful doses mixed in two or three tablespoonfuls of cold water with a little sugar. A teaspoonful of Sherry wine added to the egg albumen makes it very palatable. Beef broth, oyster soup, with the oysters taken out, chicken broth and various gruels are the additional foods given for the first two to four days. After the third or fourth day, a soft diet may be instituted, provided everything is going well,—soft boiled eggs, custard, bread, milk-toast, egg-nog, tapioca, junket, etc. After the first week, a general diet can gradually be allowed.

This diet applies to those cases in which it has been necessary to do a laparotomy, while in those cases where vaginal operations have been done and the peritoneal cavity not entered, such strict regulation of the diet is not only unnecessary, but detrimental, for it is necessary to nourish the woman as early as possible so as to assure an early and sufficient milk supply for her babe. In the latter type of cases, therefore, a liquid diet is adhered to for the first day only. On the second day, a soft diet is given and on the third day, after the bowels have moved, the patient is gradually placed on a general diet. This early feeding of the patient will prevent the great loss of weight which was so frequently observed in former days.

The Care of the Bowels.—The peristaltic movement of the intestines after every laparotomy is impaired, and before this peristaltic movement begins the bowels are usually distended, and it will be noticed that this peristaltic movement will usually set in about the second postoperative day and begin to give the patient trouble. A great amount of tympanitis is apt to follow where the bowels have been imperfectly emptied before operation, and, in consequence of this, receive much handling and often trauma during the operation. Then, too, in laparotomies on obstetric cases a large tumor is suddenly removed from the abdomen, and the now much relaxed abdominal walls give the intestines great space to dilate. Imperfectly emptied bowels are the rule, rather than the exception, in a large number of obstetric operations, for the reason that many of them are emergency operations and have not been prepared previously. Marked tympanitis in the average laparotomy oftentimes means peritonitis; this, however, does not apply to laparotomies for obstetric purposes, for the reason above mentioned, unless the tympanitis is persistent. The essential indication is to cause peristalsis of the intestines. This can often be easily and gently produced by the introduction of the rectal tube. If the passage of the rectal tube does not suffice, then enemata of soapsuds, glycerin or alum will produce the desired results. Where great difficulty is encountered, the use of eserín or pituitrin (the latter in 2 c.c. doses intramuscularly) is usually followed by marvelous results. When it can be foreseen that an obstetric case must be terminated by laparotomy or some other major operation, or even when the case is one of an emergency, a small dose of calomel given immediately before the operation is begun is of great value. The calomel will begin to act in about eight hours, and the intestinal tract will be emptied of a great deal of its contents, and in this way prevent much of the postoperative tympanitis and gas pains. We must, however, be reasonably certain that the intestinal tract is not going to be entered during the operation, and of this we can almost always be sure in the great majority of such cases. In all cases of postoperative tympany, we must determine whether this condition is due to an ileus or not, for the fate of the patient hangs on the attendant's timely decision.

Control of Pain.—The morphine given prior to an anesthetic usually suffices to take care of the pain after operation for some hours, but if the patient is still complaining much at night, morphine in small doses usually controls the pain for several hours. The objection to morphine is that it diminishes peristalsis and also pro-

duces constipation, and should, therefore, be given in small doses only, and only if patient suffers severe pain. The use of codeine does not seem to diminish the peristalsis as much as the morphine and can, therefore, be given more freely if the patient continues to have pain and more narcotics are required. Fortunately, the average obstetric operation is not followed by a great amount of pain and one is really seldom called upon to give narcotics of any description.

Changing of Dressing.—For the clean abdominal case, like all other clean surgical cases, the dressing is not changed until about the eighth or ninth day. Where silkworm gut has been used as stay sutures and these are tied over a roll, as is my practice, they are not removed until the tenth day. I always use the Michel clips for approximation of the skin and if these have not been pressed together too firmly, a roll of gauze can be placed over them and the silkworm gut tied over the roll so the clips need not be removed at any earlier date than the silkworm gut. It is essential, however, that the clips be pressed together just enough to bring the skin edges together, otherwise they will bury themselves deep into the skin after four or five days.

Vaginal wounds must naturally be dressed more frequently. It is necessary to change the dressing every time the patient has voided urine or when the bowels have moved. A cleansing pitcher douche of 1:2000 bichloride of mercury is given and a fresh perineal pad applied.

Thrombosis and Embolism.—The very frequent occurrence of thrombosis after gynecologic operations is so common that it today excites but little comment, and the same condition applies to operations for obstetric purposes.

There is no doubt that many of these cases of thrombosis are due to infection, but not all, as was and is still believed by some, for as Virchow and others have shown, the conditions necessary for the production of a thrombus are a slowing of the blood stream, a change in the blood itself, and changes in the vessel walls.

That many cases of thrombosis are due to mechanical causes is proved by the fact that not infrequently do we see thrombosis of the femoral vein after perfectly normal labors where the labor has progressed rapidly and where absolutely no examination or instrumentation was performed, eliminating the possibility of carrying infection into the genital tract. We also know that cases of myoma, with severe bleeding, are often afflicted with thrombosis

without any operation having been performed, and the same applies to cases of carcinoma.

The treatment of thrombosis consists first of all in prophylaxis. Asepsis must be scrupulous; operations must be carried out so as to prevent undue trauma and bruising of the blood vessels of the abdominal wall and pelvis, and an attempt must be made to improve the general condition of the patient before operation. Unfortunately, the latter condition can not always be fulfilled in obstetric operations, owing to the fact that so many are emergency cases. The most important factor in preventing postoperative thrombosis, in my opinion, is exercise. I do not believe, as do some of the European authors, that the patient should be brought out of bed and walked across the room on the first or second day after operation, but I have my patients turn from side to side several times a day after the first day; have the legs massaged regularly each day; have the patient practice raising the legs five or six times each day, and after the third day assume the sitting posture in bed.

The after-treatment of thrombosis consists in trying to prevent the occurrence of pulmonary embolism and to promote the absorption and organization of the thrombus. After a thrombus has developed, absolute rest is essential. In the common type of thrombosis, viz.; phlegmasia alba dolens, the limb is elevated on pillows or in a special cradle (Fig. 390). The box must be well padded and especially must the heel be well protected. The patient must never be allowed to move the limb by herself, but the nurse or attendant may occasionally move the limb in a more comfortable position, but all movements must be made with the greatest of care in order to prevent dislodging the clot. The application of ointments is of no value, but a light ice bag applied over the thrombus gives the patient much relief from pain and often prevents the use of morphine. Frequent changing of the ice bag is necessary to avoid freezing. No massage should be permitted for several months after the patient is up. After six or eight weeks the clot may be considered firm enough to allow the patient to move about somewhat; she should however, be kept in bed until her temperature is normal. After this she may be allowed to sit up in a chair for fifteen to thirty minutes, and at the end of another week be allowed to make a few steps about the room. The leg and foot usually become quite edematous after the patient gets up, and this condition is very alarming to her unless she has previously been advised about it; this edema goes down promptly when the leg is again elevated. Edema of this sort often lasts for many months, and even a year,

after the patient is up and around. The use of an elastic stocking, or a well applied flannel bandage keeps the limb from swelling greatly and gives the patient much comfort. It must be remembered, however, that in a subsequent puerperium, the thrombosis may recur. When pulmonary embolism has occurred the case is usually hopeless. Trendelenburg's method of opening the pulmonary artery and removing the clots has not been successful; in fact, the patients usually die before one has a chance to operate.

The question of nursing the child in cases of phlegmasia dolens is a serious one. As a rule, owing to the high temperature of the patient, her milk soon diminishes or completely disappears. The



Fig. 390.—Phlegmasia cradle. Adhesive strap is to support the hall of the foot. The board is well padded. (De Lee's Obstetrics.)

great effort necessary to nurse the child is detrimental, and for these reasons it is generally advisable to take the child off the breast and institute artificial feeding.

Cystitis.—Cystitis following obstetric operations is quite frequent. This is due mainly to the fact that very many, perhaps most of the cases, even after a simple forceps delivery, require catheterization at least once or more after delivery. Catheterization not only introduces bacteria, but frequently produces an abrasion of the mucosa of the bladder or urethra. We also find cystitis developing in cases that have been in labor a long time, when the fetal head has pressed against the bladder and produces a decubitus. The treatment of cystitis consists first of all in prophylaxis. Certain general rules apply

in obstetric surgery, as well as in general surgery, such as the use of soft rubber catheters instead of metal or glass; great care in asepsis, and particularly in those cases where the fetal part has pressed against the bladder for a long time. These cases are especially prone to infection. The use of the smallest catheter possible is always advisable. The advice given by many to irrigate the bladder after each catheterization with boric or other solutions, has not been found of any special value except where actual injury to the bladder has taken place. It is desirable in most operative cases to refrain from catheterization as long as possible; thereby lessening the danger of infection. If a patient can get along without having the bladder emptied for eight to twelve hours, and if such simple means as allowing a stream of warm sterile water to run over the genitals does not cause the patient to void spontaneously, then catheterization will become necessary. In obstetric cases, however, it is often not advisable to allow the bladder to fill to the same degree that we would allow in operative cases generally, for the reason that a filled bladder not infrequently is the cause of insufficient uterine contractions, thereby contributing to postpartum hemorrhage. It is often necessary to empty the bladder more frequently in these cases either by spontaneous evacuation or catheterization. After the simpler obstetric operations, such as forceps deliveries, versions, etc., it will do no harm in the majority of cases to allow the patient to be elevated in bed, or even to be carefully lifted out of bed on a commode, unless some special contraindication exists. It is my custom to instruct the patient, during her pregnancy, to practice voiding urine over a bed pan; for many patients are unable to make use of the bed pan even when no operation has been done. This simple method is, no doubt, responsible for the small proportion of cases that require catheterization in my practice when I have been able to observe them for some months before delivery.

When cystitis has developed in spite of all precautions, then as soon as the diagnosis of this condition has been made, the patient is placed on a bland diet. Small doses of morphine are given to relieve pain and an abundance of alkaline water is given. In the beginning, the bladder is sometimes very sensitive so that irrigations can not be made, but as soon as the acute sensitiveness leaves, irrigations of a warm 2 per cent boric solution should be used until the liquid returns clear, twice daily. After this a teaspoonful of a 50 per cent argyrol solution should be instilled into the bladder and left there. Protargol in 10 per cent solution may be used instead of

argyrol. The use of hexamethylenamin in 15 to 20 grain doses is of value. If the case tends to become protracted, a careful cystoscopic examination should be made under anesthesia, and the bladder drained for several weeks by making a vaginal incision. A vaccine made by culture from the organism in the bladder, and injected into the patient is sometimes of great value.

Catheterization.—When it becomes necessary to catheterize a patient during or immediately before an operation, the nurse or as-



Fig. 391.—Catheterization.

sistant should perform the operation as carefully as though the peritoneal cavity was going to be invaded. Everything should be at hand for a careful aseptic technic. The hands should be carefully cleansed as for any other operation, and the parts of the patient likewise cleansed in the same manner. The nurse spreads the labia apart with the thumb and index finger of one hand, and with a pledget of cotton caught in the end of an artery forceps cleanses the vulva, paying particular attention to all creases, with soap and water, followed by some antiseptic solution such as bichloride of mercury or lysol. This is preferably done over a bed pan if the

operation, such as forceps delivery, is to be done on the patient's bed which so often becomes necessary in the private home. (Fig. 391.)

After due attention has been given the cleansing of the parts, the assistant or operator with sterile gloved hands, spreads sterile towels about the parts and drapes the patient properly. When this is all completed, the patient is ready for catheterization. The assistant separates the labia with the index finger and thumb of the left hand and the catheter in the right hand is then inserted with

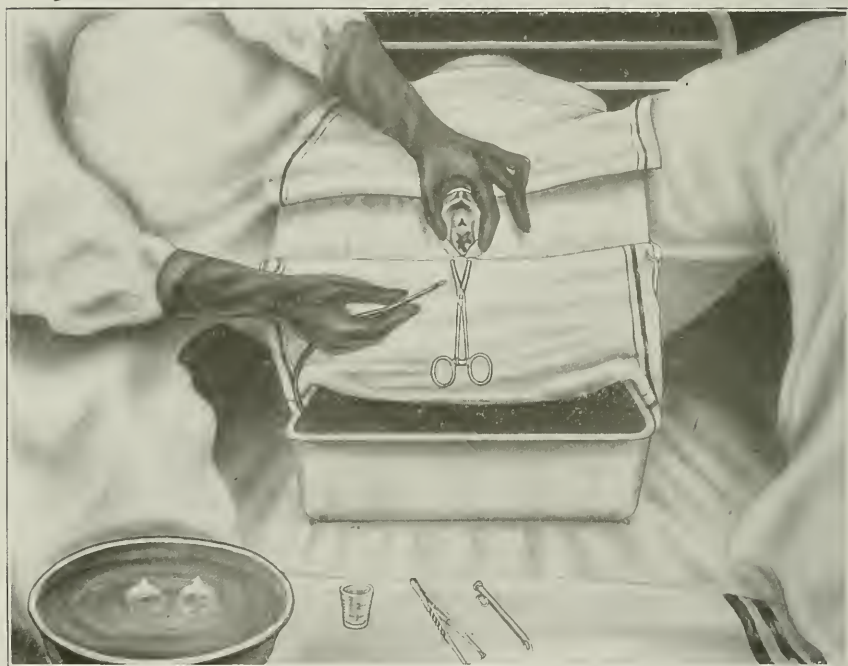


Fig. 392.—Catheterization.

the utmost gentleness into the urethra. The catheter must positively not touch anything on its way into the urethra. If by chance the catheter has been contaminated, it must either be resterilized or a fresh sterile catheter used. (Fig. 392.)

Too much aseptic precaution can not be practiced in catheterizing; one is always rewarded, when great care has been exercised, by a very small number of cystitis cases.

After having covered in a general way the essential things under the title, "general consideration," I shall now take up the most im-

portant and the common obstetric operations and deal with the after-treatment in each case.

Induction of Abortion and Premature Labor.—If the induction of abortion has been performed during the first eight weeks of gestation, the uterus can usually be emptied in one sitting, by means of dilatation and curettage. The uterine cavity is gently filled with a piece of one inch iodoform gauze strip. This prevents bleeding and tends to produce a firm contraction of the uterus. The gauze strip should be removed twenty-four hours later. Before considering the induction of abortion complete, however, the finger should always be introduced into the uterine cavity to determine whether or not it is completely empty; the curette is often deceiving.

When it becomes necessary to induce labor at a later period of gestation, other methods are desirable, but the after-care is the same. The treatment consists in the administration of ergot in 15 minim doses three times daily for about one week, the patient is kept quietly in bed for one week or ten days, and no vaginal douches are given, except when the discharge becomes foul, then a douche of 1:3000 bichloride of mercury may be used. The external genitals are cleansed regularly with pitcher douches after urination or defecation. It is well to move the bowels with a mild laxative on the second day after operation. Liquid diet is given the first day; after the bowels have moved, a soft diet, and within a day or two later a general diet is permitted. The mortality following these operations is small when done properly, yet great danger exists from infection, and there is perhaps no operation that requires such rigid asepsis as the induction of abortion and premature labor. Owing to the very softened condition of the uterus, the possibility of perforation with the curette or finger must always be kept in mind. If sepsis occurs, this must be treated according to the special indications arising. In those cases in which it seems desirable to empty the uterus of an advanced pregnancy in one sitting, owing to the seriousness of the case the so-called accouchement forcé is frequently made use of. The dangers of deep cervical tears, which not infrequently extend up into one or both broad ligaments with attending profuse bleeding, are the objections to this procedure. When such tears occur, it is necessary to repair the cervix with silk or catgut to stop the bleeding, contrary to the general teaching of leaving cervical tears unrepaired. If the cervix is repaired with absorbable material, forty-day chromic catgut should be used, as catgut absorbs very quickly when exposed to the vaginal and uterine secretions. Forty-day catgut will last about ten days in this locality.

Hydatidiform Mole.—It is always necessary to empty the uterus for this cystic degeneration of the chorion, unless the uterus has emptied itself spontaneously. No matter whether it has been emptied by artificial means or spontaneously, the interior of the uterus must always be carefully palpated for any remaining portions of the mole. A careful curettage is always indicated. Whether a mole is malignant or not, is impossible to state, but all moles must be considered potentially malignant and the possibility of a chorion epithelioma developing afterwards must always be kept in mind and the patient warned about the recurrence of bleeding. The development of a chorion epithelioma would appear to depend on the completeness with which the mole is expelled or removed.

As regards chorion epithelioma, it is perhaps unnecessary to remind the reader that a vesicular mole is not essential for the development of this disease; it may follow any pregnancy, but is more frequently observed after vesicular moles.

Hemorrhage for the first few days after emptying the uterus is not uncommon, owing to the tendency of the uterus to relax, and this condition must be carefully watched. The administration, by mouth, of fifteen to twenty minims of ergot three times daily is of value to keep the uterus contracted. In the event of severe hemorrhage, packing must be resorted to.

The patient should not be allowed to leave her bed until all bloody discharge has stopped and the uterus has become so well involuted that it can no longer be felt through the abdominal walls. In the convalescence, tonics consisting of strychnine and iron should be prescribed.

A patient from whom a vesicular mole has been removed must be carefully watched for some months, at short intervals, and in case chorion epithelioma should develop, the uterus must be extirpated immediately. It is always advisable to caution the woman against becoming pregnant until a considerable time has elapsed. The breasts usually cause little disturbances, but if they should become engorged, a tight binder firmly pinned about the chest generally takes care of this minor disturbance which sometimes arises.

Forceps Deliveries—Versions—Destructive Operations.—The after-care of these patients consists of no more than the care after a normal delivery, except where serious tears have occurred or where the woman, as a result of a prolonged labor, has become extremely weakened and subjected to the dangers of septic infection. When, however, it has been necessary to enter the uterine cavity with the hand, as in versions, or for the performance of the destruc-

five operations, it is always well to use a copious antiseptic douche immediately after labor has been completed. When, as a result of the labor, deep tears from the cervix have occurred, which are followed by continued profuse bleeding, the cervical tear must be properly sewed unless the time so consumed would further endanger the patient; in such event a well applied packing should be made use of. Perineal lacerations should be immediately repaired unless such interference would further jeopardize the patient's life, in which case the repair would have to be deferred to a later date.



Fig. 393.—Massage of breast. Even compression of entire breast. First motion. (De Lee's Obstetrics.)

It is always advisable to administer ergot in some shape or form immediately after delivery in order to prevent a relaxation of the uterus, and bleeding.

Patients who have gone through the ordeals of a difficult labor and lost a great deal of blood and possibly have had a long anesthesia, have little resistance against infection and it behooves us to prevent bleeding as much as possible. I usually administer 1 c.c. of erutin hypodermically immediately after the completion of labor. After the ordinary forceps delivery or version, the mother has, as a rule, gained sufficient strength to allow her babe to be

placed to her breasts after twelve hours. She is, however, never disturbed for this duty until such time has elapsed, after which the babe is placed to the breast every four hours and when the milk supply has been well established a three hour schedule of nursing is followed with the exception of the night, when the babe is allowed to sleep four or five hours without nursing. Those babies who are not gaining in weight or are not getting enough to eat, when nursed at regular intervals, are given supplemental feedings. If, as a result of difficult forceps delivery or version, a child is stillborn and the milk supply becomes established in the mother's



Fig. 394.—Massage of breasts. Second motion. (De Lee's Obstetrics.)

breast, the discomfort caused by this condition often becomes quite an annoyance. If the patient is in a maternity hospital, a healthy undernourished babe of some other mother may be applied to the breasts, at least temporarily. This is a good plan for the reason that it keeps the patient's uterus well contracted and favors involution. Later, when the mother returns to her home and does not see fit to continue the plan of aiding another infant, saline laxatives administered to the patient and tight binding will generally effect a prompt drying up of the breast secretions. Pumping the milk out of the breast should not be practiced except very occa-

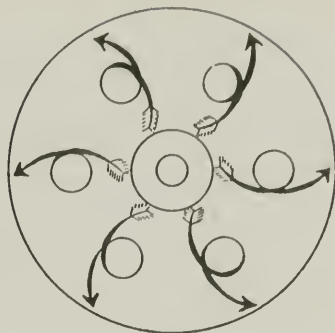


Fig. 395.—Diagram of outward strokings. (De Lee's Obstetrics.)



Fig. 396.—Massage of breasts. Third motion. (De Lee's Obstetrics.)

sionally when the breasts become too tensely filled and cause the woman too much discomfort. As nothing is so stimulating to the continued breast secretion as nursing, so also is the continued pumping likely to produce the abundant secretion. The use of drugs I have found of no value in this condition. Instead of using the breast pump, when the breasts become too engorged from lack of



Fig. 397.—Stimulating massage. (De Lee's Obstetrics.)



Fig. 398.—Stimulating massage. (De Lee's Obstetrics.)

nursing, massage may be carried on in the following manner as described by De Lee. (Figs. 393-398.)

The attendant's hands are sterilized and the breasts thoroughly anointed with oil or vaseline. First, the whole breast is evenly compressed against the chest by spreading both hands smoothly and evenly over the organ. This process should not be painful, but it presses the blood and lymph out and away from the gland. After this pressure has been carried on for a few minutes and the entire gland covered, gentle circular strokes are made from the nipple toward the periphery. The four fingers make circles around the nipples, pressing harder as they go away from the nipple. The breast is steadied by the other hand. After circling the breast twice, the third motion is instituted. One hand steadies the breast, while four fingers of the other hand wipe the milk toward the nipple. This is the least important of the three motions. The last motion is a repetition of the first. De Lee says, and from personal experience I can vouch for the statement, that patients will nearly always feel much relieved after this procedure, even though little or no milk has been expressed. Following this massage the breasts are firmly bandaged. This method of massage is necessary only when the breasts are painfully enlarged, and rarely becomes necessary more than once or twice a day.

Care of the Nipples.—The nipples should be thoroughly washed before and after each nursing with boric acid solution, in order to avoid the possibility of bacteria being ground into them during nursing. If the nipple becomes cracked every attempt should be made to have it heal quickly, for through such abrasions and fissures, infections take place, and the occurrence of suppurative mastitis often follows. When the nipples are cracked, the babe should not be allowed to nurse from such breasts for twenty-four hours, if possible. In cases where it is absolutely necessary to nurse the babe in spite of the injured nipple, other means of rest must be adopted, and this is best attained by the use of nipple shields.

Nipple shields are unsatisfactory in many cases because the holes in the rubber nipples are too small, which makes it difficult for the child to nurse properly, but if they are enlarged by passing a red hot needle through them the milk will flow sufficiently rapidly to nourish the child properly. The application of bismuth subnitrate applied in the following form after each nursing will help to heal the wounds in the nipple promptly.

R.	Bismuth sub. nit.	4.0
	Ol. Ricini	30.0
	Mft. Mist.	
Sig.:	Apply locally.	

The Conduct of the Puerperium in General.—It is perhaps safe to say that the treatment of the puerperal woman after operative delivery is, in a general way, the same as after a normal delivery. It varies slightly in those cases in which an abdominal operation has been performed. I shall, therefore, state briefly the care which I give my puerperal patients in a general way, and later speak of the special indications under their special headings.

After the placenta has been expelled and carefully examined to make sure that it is intact, the attendant should watch the uterus. At this time it should be hard and firm, and if it remains so, there is no danger from postpartum hemorrhage; but if it becomes soft and flabby such danger is imminent, and proper methods must be taken at once to guard against it. The uterus should be grasped between the thumb and four fingers and firmly kneaded, at the same time pressing downward toward the pelvis. The vigorous and rough handling of the uterus that one so often sees at the time of hemorrhage is not only useless but harmful, gentle but firm pressure is all that is necessary. This kneading should be continued until the uterus remains firmly contracted; it may require an hour or more. At the same time, ergot or ermutin is administered hypodermically. I do not use ergot systematically after every third stage, unless indications arise. Every uterus should be watched at intervals for one hour. After the labor is completed, the external genitals are cleansed with a 1:3000 bichloride solution, and a sterile vulval pad, made of cotton wrapped in gauze, is applied. After every bowel movement or urination, the external genitals are likewise cleansed and a fresh vulval pad applied. The washing must always be done from above downward to avoid contamination from the rectum. If there is any odor to the lochia a 2 per cent carbolic or lysol solution is used as a deodorant. The patients are instructed not to touch the genitals at any time. No douches are given and no internal examinations are made except when specially indicated and then only under the greatest aseptic care. If the perineum has been stitched, the same care and even greater watchfulness is necessary. Unclean bed pans and soiled bedding have infected many a perineum.

The Binder.—Much has been said for and against the binder. I use the binder regularly because the patient feels that she is being held together and does not experience that emptiness of which so

many complain without them. It is hardly possible to apply a binder tight enough to produce a backward displacement of the uterus, but with a proper pad placed above it, it is possible to keep the uterus from rising in the abdomen and filling with blood.

After-Pains.—After-pains are controlled by $\frac{1}{4}$ gr. morphine given by mouth. It seems useless to allow a woman to suffer for hours trying all sorts of other methods when one small dose of morphine almost invariably controls the pain. After-pains, as is well known, occur chiefly in multiparae. When they become severe in the primiparae the retention of clots or placental fragments or even infection should be suspected.

Rest and Sleep.—After the toilet of the patient has been taken care of, the room should be darkened and the patient left alone and encouraged to sleep. If unable to sleep, sodium bromide in 20 gr. doses is given. Morphine rarely becomes necessary. The babe should be moved to another room where it will not disturb its mother for twelve hours.

Time of Getting Up.—It has been the custom for thousands of years to keep the puerperal woman in bed for ten days. Whether this is proper or not is not certain. Lately a number of authors have advocated getting the patient out of bed very early on the first, second or third day after labor. This practice, to me, seems too radical. It is my custom to keep the puerperal woman in bed from eight to ten days. On the eighth or ninth day she is allowed to sit up in bed and on the tenth day she is permitted to get out of bed in a comfortable chair for an hour, and on the day following for three hours. She is not allowed to go down stairs until the end of the third week. Operative cases, or cases that have run an abnormal puerperal course, should be kept in bed longer and should be slower in resuming active movements. The patient is, however, not kept absolutely quiet in bed. She is allowed to be turned on one or the other side the first night, for very few can sleep well on their backs. Changes of position are allowed as often as the comfort of the patient demands, provided they are done within reason.

Final Examination.—At the end of about the sixth week, a careful examination should be made. The size and position of the uterus should be determined. Special attention should be given to the condition of the adnexa and broad ligaments and the firmness of the levator ani and perineum. If the uterus is retroflexed or retroverted, it is to be replaced and a properly fitting pessary inserted. Such a pessary must be worn for four to six months. If

the perineum is relaxed, the patient should be instructed in exercising the levator ani muscles. General exercises of legs, arms and trunk are of value in strengthening the relaxed abdominal walls; they must, however, be carried out for eight months to a year to be of any value. The physician's duty to his patient is not complete unless he has given her full instructions for her future care, and particularly in warning her against an early pregnancy if she has just had a severe and difficult labor.

Reappearance of Menstruation.—Most women are anxious to know something about the reappearance of their menses. I think it is safe to say that the majority of women menstruate within the first six months after labor; while in a small percentage it does not appear until much later. If, for any reason, a woman does not nurse her child, the menstrual flow will most usually appear in about eight to ten weeks after labor. In some few cases, the menses appear one month or six weeks after labor and then fail to appear for several months. This will usually bring the patient to her physician at once, for she will fear another pregnancy, but as a rule, she can be assured that the condition is due to other causes.

Puerperal Wounds.—The puerperal woman must always be considered a surgical case and treated as such. There are always a number of wounds which must be treated aseptically, or they will become infected and even a general infection follow. In every case of labor, the hymen tears and its remains are seen at the vaginal entrance called the *caruncula myrtiformes*. Smaller or larger tears occur around the clitoris, in the cervix, the vaginal wall and the perineum almost regularly, particularly in the *primiparae*. All of these wounds must heal either by primary union or granulation and suppuration. All of these tears usually heal promptly if properly sutured under aseptic precautions and kept clean thereafter. Infections of the perineum lead to improper healing with relaxation of the vaginal outlet, while if cervical tears become infected, they frequently lead to a parametritis and a prolonged invalidism. After such wounds have been properly handled during the process of delivery, it is necessary to warn the nurse of the existing conditions, and to caution her to be particularly careful, for many properly conducted cases have been infected through the carelessness or ignorance of the nurse.

Lochia.—During the first few days after labor there occurs normally a discharge from the genital tract. This discharge on the first day is almost pure blood (*lochia rubra*); after three or four days the discharge becomes much paler (*lochia serosa*); and gradually,

after the tenth day, owing to the great admixture of white blood corpuscles, the lochia resembles cream (*lochia alba*). Normally, the odor is not offensive but is not unlike the odor of the menses. Foul smelling lochia indicates infection with putrefactive bacteria. A long persistence of the lochia rubra indicates improper involution of the uterus from some cause, as getting up too early, or infections, or it may indicate the retention of portions of the placenta. If the lochia rubra persists for a long time, the patient should be kept at rest until the uterus becomes better involuted. Hot douches, if late in the puerperium, may be given and fluid extract of ergot in 15 to 20 minim doses, three or four times daily should be administered. If the lochia rubra continues on account of retained secundines, intrauterine irrigation, or even gentle curettage may become necessary. Douching during the puerperium is rarely necessary, and is usually contraindicated. If the discharge is very foul smelling, the douching with a 1 or 2 per cent lysol solution may act as a very pleasing deodorant. Great care, however, must be exercised in carrying out such a douche in an absolutely aseptic manner. Douche can and nozzle as well as the solution must be absolutely sterile and the hands of the attendant must be prepared as for operation. Where intrauterine douching is done, the patient must be brought in position so that the cervix can be easily exposed and the douche nozzle must touch nothing on its way to the uterine canal. Great care must be exercised in selecting the proper solution for intrauterine douching, as poisonous solutions such as bichloride of mercury or carbolic acid are readily absorbed in the uterine canal and can produce general poisoning. Personally, I have seen a few cases of carbolic acid poisoning from intrauterine douching with such a solution.

The After-care of Perineal Lacerations and Episiotomy Wounds.—After the perineum has been repaired, the genitals are cleansed and a sterile perineal pad is applied. The wound should not be dusted with dusting powders, for these only become mixed with the lochial discharge and are difficult to remove later. It now becomes the duty of the nurse to watch the patient. It is unnecessary, in perineal operations, to tie the patient's legs together in order to restrict the movement of the limbs, as was formerly the practice: this only makes the patient more uncomfortable and does no good. In general, the patient may be turned on her side within a few hours after labor if she desires it, but in most cases she will be more comfortable on her back.

If the sutures of silkworm gut have been left long and tied together they will not be likely to annoy the patient as much as if cut short, but when long, they gather more of the lochial discharge and it will be necessary for the nurse to keep them very clean by regularly using pitcher douches and wiping away anything that may accumulate. Infection of wounds about the perineum, from the nurse's hands has happened quite frequently and should receive more attention. All surgeons know that it is impossible to disinfect the hands by any known means when they are infected with virulent microorganisms until at least several days have passed, yet nurses not infrequently go from a virulent septic case to a confinement case without considering it dangerous or giving it any thought. The chief sources of infection of the nurse's hands are the handling of douche pans, bed pans and of septic dressings. It, therefore, becomes the duty of the obstetrician to learn whether the nurse active on the case has recently been caring for a septic case, and, in such event he should not permit her to care for the case on hand.

Catheterization, where perineal repair has been done, is not necessary unless the patient is unable to void. I allow my patients to urinate without fear of contaminating the wound. In perineal repairs of the first and second degree, the silkworm gut sutures may be removed after the tenth day; they should, however, be regularly inspected and if any show a tendency to cut into the skin they should be removed earlier. Neither the obstetrician nor the nurse should touch the wound when dressing, all discharges are removed by pitcher douches, irrigation or by means of gauze or cotton and sterile forceps. In complete perineal lacerations when the sphincter ani and the rectum have been sewed, the silkworm gut sutures which have been passed through the sphincter are not removed until the twelfth day, likewise the rectal sutures. In order to remove these sutures, the patient is brought in the lithotomy or Sims' posture and a very narrow speculum is inserted into the rectum to expose the sutures. As a rule, about the twelfth day these sutures have become loosened so that they may be removed by gentle traction without cutting the loop. Great care must be taken to avoid undue traction with the speculum on the sphincter ani muscle.

It was formerly the practice to constipate the patient with opium after repair for complete perineal laceration. This has been discontinued now, and I believe that it is a general practice to have the bowels move early. The patient should be given a diet which

will form little or no stool, e. g., albumen water, fruit juices, strained broth, tea and coffee, etc. On the second day after repair an ounce and a half of castor oil or sweet oil is administered. When the patient experiences a desire for evacuation, she is given an enema of olive oil or sweet oil and this is followed by a plain enema of sterile water. The enema must be given through a small soft rubber catheter. The patient must always be instructed not to strain, and after such bowel movement the parts must be thoroughly cleansed. This should be repeated every second day until about two weeks have elapsed after which daily evacuations are secured by the administration of compound licorice powder or cascara. The above mentioned restricted diet is adhered to for ten days. It is well to keep such patients in bed three weeks. Straining at stool must be avoided for several weeks after the patient is up and around.

Cæsarean Section.—The after-treatment of Cæsarean section cases does not vary greatly from that after the usual abdominal section. If the case is an emergency one, a small dose of calomel is given immediately before the operation. The calomel will act in about eight hours and relieve the patient and prevent much of the postoperative tympanitis and gas pains. Morphine for pain is rarely necessary, but may be given to keep the patient quiet the first night. Castor oil is given on the morning of the second or third day. The oil is best administered either in orange juice or beer foam. Few patients object to the oil, but if for some reason or other the patient is unable to take it, magnesium citrate may be given. When the bowels have been thoroughly emptied a daily enema of soapsuds usually suffices to keep the rectum empty.

The child is put to the breast at the end of twelve hours, if the patient has recovered sufficiently from her anæsthetic. The diet is the usual one after laparotomies, but a nourishing diet should be established as soon as conditions warrant it so as to supply the necessary milk for the babe. Infections following the conservative Cæsarean section should be very rare, but if peritonitis should occur the abdomen is to be opened promptly and drained. Abscess of the uterus sometimes occurs and should always be suspected if there is a mild temperature and signs of local peritonitis. These abscesses usually break on the surface. If drainage is good, the patient should recover promptly, but the uterus will probably become permanently fixed to the abdominal walls.

Lochia-metra is not uncommon following the conservative Cæsarean section, owing to the insufficient dilatation of the cervix: also

sometimes due to a retroposed uterus. If the lochia has become scant or almost absent and the temperature rises, the cervix should be carefully exposed and gently dilated with a metal dilator. If lochia-metra is present this procedure will be followed by a copious flow of lochia and the temperature will promptly drop. No intra-uterine douching should be done for fear of breaking a suture and thereby producing a leak in the abdominal cavity. Cæsarean section cases are kept in bed from two to three weeks.

Adhesions between the uterus and abdominal wall are common, particularly if a slight infection has taken place. The high incisions will, in most cases prevent these adhesions for the reason that the uterus contracts and the fundus is below the line of the abdominal incision before the closure is completed. Pituitrin is given in each case. Formerly I always gave pituitrin in 1 c.c. doses as a prophylactic against hemorrhage immediately before the abdominal incision was made, but lately I have followed the suggestion of Williams. I shall borrow freely from his report on this subject. This time was chosen on the basis of allowing three minutes for delivery, since the action of the drug is very rapid. In a number of cases, however, the inability to deliver in three to five minutes on account of operative difficulties has produced a distinct danger of asphyxiation of the babe and therefore, Williams has given up this and made a change in the time of injection. At the present time the sterile syringe and ampoule of pituitrin are ready, and the injection is given in the posterior wall of the uterus just as soon as the babe is delivered. Owing to the very rapid action of the drug, the uterus contracts powerfully in one and one-half to two minutes and this newer method has proved very satisfactory. Pituitrin, however, has not displaced ergot in stopping hemorrhage, for the effect of the drug wears off in about one-half hour. In order to keep the uterus well contracted a hypodermic of aseptic ergot or ernutin should be injected immediately following the completion of the operation.

When Cæsarean section has been done for placenta previa, a careful watching of the uterus is extremely important and the additional use of the above preparations may become necessary. If bleeding becomes alarming, packing or even hysterectomy may have to be resorted to. The after-treatment of Cæsarean section cases for eclampsia is often very complicated and the real attention often only begins when the operation is completed. First of all absolute and complete rest is essential, the room must be darkened and all noise excluded. Visitors are absolutely forbidden



Fig. 399.—Electric heater closed.

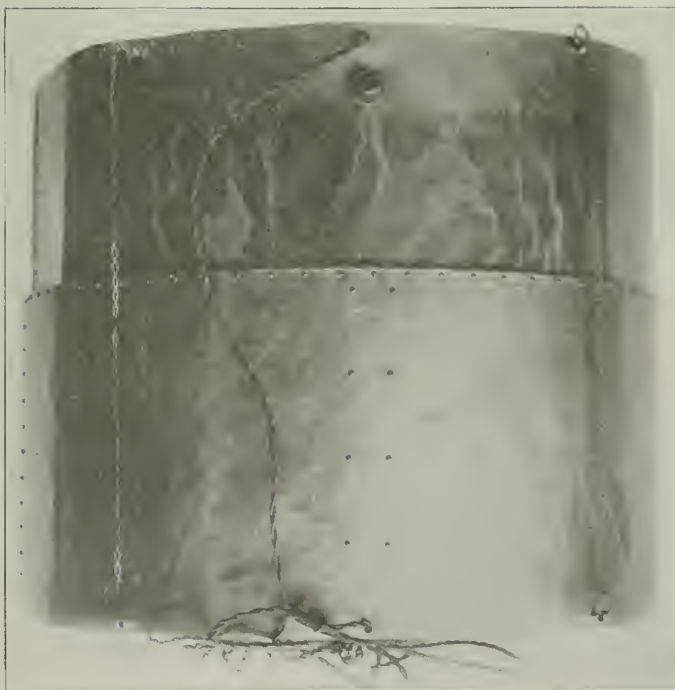


Fig. 400.—Electric heater open.

for fear of starting a renewed attack after the operation. It is generally recognized that the rapid and early emptying of the uterus, as by Cesarean section or other methods, as early after the first convulsion has taken place gives the best results. But the convulsions may recur even as late as a week after delivery and since such is the case the patient requires constant watching. Puerperal insanity sometimes occurs and the woman may make an attempt at suicide or try to kill her child. If the attacks should recur, inhalations



Fig. 401.—Electric heater. Interior view.

of chloroform may be made use of, or morphine or chloral administered. These drugs should be used sparingly, however, for the attacks are but a symptom of a general intoxication and while the frequently repeated convulsions and cyanoses are a severe strain on the heart, yet it is the intoxication that is to be feared and one should hesitate before adding other poisons as morphine, chloral, chloroform, etc., to an already overloaded circulation. A thorough elimination must be started early. A large dose of epsom salts should be given as soon as the patient is able to take it. If an emergency, croton oil may be administered.

The skin must be started to do its work promptly and this can best be accomplished by hot wet packs or the electric baking oven as used in gynecologic practice (Figs. 399-401). With this oven the patient can be brought into a sweat in a short time and is not disturbed nearly as much as with the hot packs. The illustration shows the apparatus open and closed. When open it will cover a large portion of the patient and if the woman is covered with a number of blankets from the chin to feet the heat created will bring about a perspiration very quickly and satisfactorily.

The apparatus is made of aluminum over a wood frame and lined with asbestos. It is so arranged that one-half telescopes into the other half and in this way a larger or smaller portion of the body can be covered. Inside the heater there are placed eight sockets for electric light globes which furnish the heat for the oven. It is best to make use of the old carbon lamp in sixteen candle power size, since they throw out more heat than the present, much used, Tungsten burners. The heater made of aluminum is light, but owing to its size, rather cumbersome to transport from house to house. After the patient has perspired freely for one-half to three-quarters of an hour the current may be turned off and the heater remain in place for another hour.

Diuresis is best obtained by a free use of liquids. Large quantities of water and lemonade by mouth and salt solution hypodermically help to favor the action of the skin admirably. One must, however, not be overzealous and overload the heart and stomach. If the patient is unconscious the liquids must be administered through a stomach tube. The one method which is not sufficiently used and has in many cases proved to be of great value is venesection. It must not be used indiscriminately, however, since in some cases it may even do harm. In those cases of high blood pressure with flushed or cyanotic face, venesection is of great value, while in cases of the opposite type, bleeding is of doubtful value, the latter cases usually require stimulation. At least 500 to 1000 c.c. of blood should be taken, unless severe hemorrhage has occurred during the time of delivery.

Artificial respiration may be necessary. *Veratrum viride* given in 10 minim doses hypodermically every thirty minutes until the pulse rate has come down to sixty per minute has attained considerable repute. I have never used it for fear of causing a sudden collapse. Lumbar puncture has been tried with unsatisfactory results, while renal decapsulation has some adherents. I tried this operation in one case with a satisfactory outcome, but believe an equally good

result would have eventually obtained with the other remedies tried. The urine must be carefully watched after the convulsions have passed and the patient is on the road to recovery. The woman must be kept on a strict diet until the urine has become almost normal. Nursing should not be allowed until the patient has been thoroughly conscious for several days and then only if her general physical condition will tolerate the extra strain of nursing. The patient's general health must be watched for several months post-partum.

If the Cæsarean section was done for contraction of the pelvis, the woman must be properly instructed concerning her condition so that she may know the need of placing herself in the care of an obstetrician in the event of another pregnancy. She should also be warned that an early pregnancy following such an operation is undesirable. This is perhaps a suitable place for considering the question of sterilization after Cæsarean section, a subject of great interest, though perhaps not strictly to be considered under the heading of after-treatment, yet it concerns the future welfare of the patient so much that I hope I may be pardoned in discussing it here. Those authors who subscribe to the dictum: "Once a Cæsarean always a Cæsarean" because they fear a weak uterine cicatrix, would probably say that a large proportion of women should be sterilized after section. The danger of rupture of the uterine scar in future labors is no indication for sterilization, for this can be avoided by proper suturing and correct asepsis. The three matters to be considered are: (1) the ethical question; (2) the danger to the mother of the repetition of the operation; (3) the danger of rupture of the uterus during subsequent pregnancies or labors.

The ethical question has been much debated and an interesting discussion followed the reading of a paper by Green at the meeting of the American Gynecological Society in 1903. He said: "I venture to assert that the only safe and moral ground for the medical profession is that based upon modern medical science uninfluenced by sociological considerations. If a woman comes to Cæsarean section and recovers, she and her husband, if she has one, should be informed of her condition, and of the prognosis and treatment in the event of future pregnancy; if subsequent pregnancy ensues, the responsibility of the treatment rests with the obstetric surgeon but the responsibility of the condition rests elsewhere."

A similar interesting discussion followed a paper read by Kerr and discussed by Spencer at the London Obstetrical Society in 1905.

Spencer made the following remarks: "The matter is an ethical one, to be decided by the doctor, and that his duty is to deliver the woman and restore her, as nearly as possible, to a natural condition, a result obtained by the conservative operation without sterilization and not by the mutilating operation of hysterectomy, nor by the unreliable and dangerous one of tying off the tubes. If the patient becomes pregnant again, the responsibility is not the doctor's, whose duty it is to repeat the Cesarean section which experience had shown to be safe."

I personally believe that the patient and her family should have the right to decide the question after conditions have been fully explained. If the patient is suffering from one or more of such chronic diseases as tuberculosis, osteomalacia, or chronic nephritis, it would be advisable to recommend sterilization, for under such conditions a repetition of pregnancy itself would be inadvisable.

When Cesarean section has been done for contracted pelvis it would depend greatly on whether or not the patient had more than one child. The uncertainty of the life of the one child would make it more desirable not to sterilize. After thorough explanation to the patient and her nearest relatives, the physician should act according to their wishes. I do not believe that the operating obstetrician has a right to ignore their desires.

Vaginal Cesarean Section.—The after-care in these cases is simple. Usually a gauze or cigarette drain is left to drain the large subperitoneal space for twenty-four hours. If episiotomy was necessary the care of the wound is the same as for perineal wounds generally. Later pregnancies and labors seem to have little or no influence on the uterine cicatrix when the wound has been properly sutured. Since the operation is performed for such conditions which demand prompt delivery, as eclampsia, premature separation of the normally implanted placenta, and in some cases of uncompensated heart troubles, the after-treatment would be directed mainly toward the handling of the conditions which called for the operation.

Hebosteotomy (Pubiotomy).—When Doederlein's technic is employed the danger from hemorrhage and injury to the bladder is not very great. Occasionally, however, severe hemorrhage takes place, when the whole bone has to be laid bare and some of the branches of the internal pudic artery must be tied. The lower or vulval part of the wound is drained with gauze, which may be removed after forty-eight hours. Immediately after the operation the patient is cleaned up and a sterile dressing applied over the upper wound. A broad adhesive strip, about six inches wide is

placed about the pelvis and trochanters so as to make firm pressure. Many German obstetricians do not attempt to immobilize the pelvis, but by strapping the pelvis firmly the patient is made much more comfortable.

The bed is, if convenient, arranged with a frame on which the patient may be moved about with ease. The usual practice is to allow the patient to remain on her back for three or four days after which she may be moved from side to side. Catheterization is usually necessary but not carried out unless the patient is unable to void. After sixteen to eighteen days the patient is allowed out of bed and is usually able to walk about the end of the fourth week.

Bony union does not occur, as a rule, the union is mostly always fibrous; this however, has no effect on locomotion for any long period of time. The gait may be somewhat unsteady for a few weeks, but later a normal walk is established. The fibrous union seems to be of some benefit for future labors, since it seems that the pelvis is thereby somewhat permanently enlarged so that a normal labor may follow, under proper conditions in the future. If the bladder was injured, a repair at the time is usually not possible, since such injuries are usually on its anterior walls. In these cases the bladder should be drained with a permanent catheter and the catheter frequently changed to prevent its becoming clogged. Hexamethylenamin is administered four times daily and every precaution to prevent urinary infection must be observed. Hematomata form in a large number of cases and not infrequently require incising and packing; if suppurating they must, of course, be drained. The mortality should not be higher than that of the classic Cæsarean section, except when done in septic cases, though with some obstetricians, sepsis is an indication for the operation. In my opinion, when signs of sepsis are present, the Porro Cæsarean or craniotomy are safer operations.

Vesico-vaginal Fistulæ.—Most fistulæ of the bladder occur as a result of necrosis, due to a prolonged pressure between the presenting fetal part and the pelvis. These fistulæ usually manifest themselves about the end of the first week postpartum, and are frequently mistaken for simple incontinence of urine. It is useless to attempt to close them at once and no operation should be attempted until four months at least have elapsed. A large number of these bladder injuries will heal spontaneously if properly treated. The bladder must be kept drained by means of a permanent catheter and hexamethylenetetramin, in five grain doses, should be given three or four times daily as a prophylactic against infection. When

the bladder is constantly leaking, the skin about the vulva and the inside of the thighs is likely to become irritated. This condition can be overcome to a great degree by the application of a thick layer of zinc oxide ointment. At a later period postpartum, the bladder opening may be repaired. If such a fistula has been successfully closed, the patient should be warned about future labors. Owing to the delicate scar following such a repair operation, and the great traumatism connected with a delivery per vias naturales, it may be advisable to recommend Cesarean section in the event of another labor.

Postpartum and Postoperative Hemorrhage.—Hemorrhage after obstetric operations or after normal labors demands prompt attention and of all conditions met with in the parturient woman, none is more urgent and more immediately dangerous to life than postpartum bleeding; neither is there any other condition which demands more skill and prompt action on the part of the attendant.

The most common cause for postpartum bleeding in a normal case is retention of the partially separated placenta or portions thereof; occasionally it may be due to defective muscular contractions of the uterus. Hemorrhage from lacerations of the cervix, vaginal wall, perineum, broad ligament, etc., occurs frequently after operative delivery.

In treating hemorrhage following labor, we must always diagnose between traumatic and placental site hemorrhage. It is well to remember that as a rule the bleeding from the placental site is much more profuse than from a laceration. Placental site hemorrhage is due to a lack of proper contraction and retraction of the uterus, and therefore, one will find a soft, boggy uterus in this type of bleeding, while when bleeding is due to a laceration only, one will find a well-contracted uterus but a continuous bleeding. When bleeding is due to retained placental tissue, the blood escapes in gushes. In some instances the bleeding may be concealed, a large quantity of blood accumulating in the uterus. In such cases one will find the fundus of the uterus gradually rising in the abdomen. Severe hemorrhage during or immediately following the third stage of labor should be very rare, when the case has been properly managed. It must be remembered that the premature and vigorous attempts at expression of the placenta are a frequent cause of partial separation and bleeding.

The treatment of postpartum bleeding, therefore, consists first of all in prophylaxis. The uterus must be carefully watched for an hour after labor and Crede's maneuver should not be practiced

until the rising of the fundus indicates that the placenta has completely detached itself. When the placenta has been expelled and signs of poor contraction take place, careful kneading of the uterus should be promptly resorted to. If portions of the placenta remain in the uterus, these should be promptly removed by the gloved hand. Great care in asepsis must be practiced, for in the haste that is so



Fig. 402.—Proper exposure for uterine packings.

often necessary, the obstetrician is likely to forget his asepsis, save the woman from the immediate dangers of hemorrhage, only to have her die from puerperal sepsis later. After removing all parts of placental tissue, 1 c.c. of pituitrin should be injected deep into the muscles of the thigh or abdomen in order to obtain quick contraction of the uterus, but since pituitrin does not have a last-

ing effect, it should be followed by crutin or aseptic ergot. These are the ordinary things necessary after a hemorrhage; occasionally, however, a sterile hot douche will aid greatly in bringing about control of the bleeding. When bleeding is alarming and still persists after all of these methods have been tried, a careful pack of the uterus and vagina with gauze is the only thing that will bring about the desired result. (Figs. 402-404.)

Packing of the uterus is evidently poorly understood, for I have rarely seen one properly done. It is always necessary to place the



Fig. 403.—Improperly packed uterus. Note impacked space high up in uterus where bleeding may continue.



Fig. 404.—Properly packed puerperal uterus and vagina.

patient either on the cross bed or on a table. The cervix must be carefully exposed as in the illustration, and a piece of gauze about three thicknesses, several yards long and two or three inches wide must be carried up to the fundus of the uterus. It is surprising how quickly a uterus will contract after a yard or more of packing has been introduced. Great care must be practiced, however, in introducing the gauze in order to avoid perforating the uterus with

the instrument used for packing and care must be exercised to see that the gauze has reached the fundus of the uterus, that no unfilled space remains in the cavity in which a concealed bleeding might take place. Personally, I never feel satisfied in packing the uterus alone, but always use a vaginal pack also, which is placed just as carefully as the former. In addition to this, a bandage and a roll over the uterus are carefully and firmly applied. The instrument illustrated in Fig. 405 has served me well in packing.

Should bleeding continue after using all of these methods, the aorta should be compressed through the abdominal walls, either by deep pressure with the hand or by means of tying a rubber tube about the patient's waist, as recommended by Momburg. When the hemorrhage has ceased, the foot of the bed must be elevated and



Fig. 405.—Packing instrument.

the patient must be kept warm with hot water bottles. If the patient has suffered much shock, a hypodermic of camphorated oil should be given and saline solution administered at once, either under the breast or intravenously. In very desperate cases, direct transfusion from the husband or near relative should be done, if the surroundings are such that this delicate operation can be carried out.

If the hemorrhage has followed a Cæsarean section, the same methods should be practiced as mentioned before. It may, however, under certain conditions, be necessary to extirpate the uterus.

After a few days the bed may be lowered gradually, a little at a time and after forty-eight hours the vaginal and uterine packing may be removed. Catheterization will as a rule be necessary, owing to the tight pack. Fluid extract of ergot in 15 minim doses should be given for several days. The patient should be placed on a nourishing diet as soon as possible. As a rule, after severe hemorrhage, the milk secretion is much diminished, so that the babe will not receive sufficient nourishment. It will depend on the condition of the patient whether nursing should be allowed or not, and unless she recovers promptly, nursing should not be attempted. Ordinarily, after severe hemorrhage, patients will require a longer stay in bed than under the usual conditions, and while in bed, tonics and iron should be given freely. Iron, hypodermically, will aid the patient greatly.

If the patient has been unfortunate enough to have become infected during the many attempts in controlling the bleeding, her recovery will probably be a very stormy one, since most cases of sepsis following hemorrhage take on a very severe course, owing to the fact that her resistance has been greatly lowered.

The After-care of Plastic Operations.—After the operation has been completed, the vagina and external genitals are cleansed and a small piece of gauze is placed in the vagina for drainage and to act as a guide for the nurse for catheterization. The gauze is removed after forty-eight hours.

In perineal or rectal operations it is not necessary to tie the patient's limbs, this only produces discomfort; in most cases the patient will be satisfied to lie quiet since movements will cause her too much pain.

The external genitals are cleansed with pitcher douches of either plain sterile or a mild antiseptic solution several times a day, then carefully dried with gauze and a clean sterile pad applied. Powders applied to perineal wound do no good, but gum up the tissues and make it almost impossible to keep the parts clean.

The patient may be turned on her side with the assistance of the nurse; great effort at turning may tear a suture or produce bleeding. After the average plastic operation the patient should remain in bed two weeks and during this time should make use of the bed pan without straining at stool. Catheterization should be avoided after all plastic operations when possible. It does no harm to have the urine pass over the perineal wound and is less dangerous than frequent catheterization. After a simple curettage or cervical repair, the patient may be allowed to sit up in bed to void urine rather than to be catheterized. A week to ten days in bed for such cases is likewise all that is necessary.

After urination and defecation a pitcher douche should always be given over the bed pan, the parts carefully dried with dry pieces of gauze and a fresh sterile perineal pad applied. Ordinarily vaginal douches are not called for, but if the vaginal discharge becomes profuse and offensive, then a mild antiseptic douche may be used. When douching a patient, the nurse must be cautioned not to use any force, and to follow out a perfect aseptic technic. Rough handling may easily spoil the result of a perfect operation. When it becomes necessary to catheterize, the same careful technic must be followed as previously mentioned.

Diet.—After the nausea and vomiting following the anesthetic have disappeared, the patient may be placed on a liquid diet, this to

be continued until after the second day, when the patient's bowels will have been moved. If the patient begins to get hungry, a soft diet may be given for a few days and after the fifth or sixth day she may be placed on a regular diet.

Bowels.—The use of one grain of calomel in divided doses of $\frac{1}{4}$ grain each, every fifteen minutes, followed the next day by castor oil, is usually very effectual. This may be followed by a soapsuds enema. The calomel is generally given on the second day of the operation. Later if the bowels fail to move daily, two teaspoonfuls of aromatic caseara may be given each night, or if the patient prefers, a small enema each day.

Removal of Sutures.—When deep silkworm gut sutures have been used in perineal wounds these should be removed at the end of one week unless they are cutting, when they should be removed earlier. In case of infection, all sutures should be removed at once. Since most vaginal and cervical suturing at the present time is being done with catgut, it will be unnecessary to remove those, thus saving the patient a great deal of pain and avoiding the dangers of injury to plastic work.

In complete rupture of the perineum the sutures holding the sphincter muscles should not be removed before the tenth day. The superficial sutures of the perineal wound may be removed after one week. Great care must be exercised in removing sutures from the rectum in complete perineal tear operation. The patient should be placed in the Sims position, and a very narrow Sims' speculum may be inserted into the anus. No attempt should be made to expose the entire suture line, but one suture at a time should be exposed. One blade of the scissors is then slipped under the loop, the suture gently drawn upon until the knot is exposed and cut at one side of the knot and drawn out. One must use caution not to cut off both sides of the loop below the knot, for this will always produce trouble until such suture is completely removed. Very often only slight traction is necessary to remove the rectal sutures if one will wait until the twelfth or fourteenth day after operation.

Infection.—This is not a common occurrence after vaginal operations, but when it does occur, it may be as serious as after any other operation. If the suture tracts are infected, the sutures should be removed at once—any abscess should be immediately evacuated. Infection occurs either at the time of operation or during the after-care. Great danger exists in carrying infection to the patient by the use of unclean bed pans. The nurse must never handle the wound with bare hands. When cleansing the wounds she should

always scrub her hands properly, and then handle the wound and everything that comes in contact with it with sterile instruments only. Douche nozzles and douche cans are likewise a frequent source of infection, and should be carefully sterilized in sterilizers arranged for that purpose.

Rest.—All patients after plastic as well as other vaginal operations need rest, they are usually the nervous and “run down” type and need careful nursing. A stay in the hospital longer than is necessary is only of value where patients can not get such care at home, otherwise, however, it is better to get the patient home and start her on gentle exercises, and in that way gradually develop her strength. She should be instructed to rest several hours a day and advised to keep off her feet and avoid heavy lifting and straining. A stay in bed of two weeks will suffice for the average vaginal operation, however, cases of proclivencia should remain in bed about three weeks. Sexual relations should be forbidden for at least eight weeks following plastic operations on the vagina.

Dr. Stuart McGuire gives these instructions to patients who have had plastic work in the vagina, as they leave the hospital:

On returning home you should consult your physician and place your case in his hands until you are well. He knows what has been done for you while at the hospital.

There was nothing in your operation to permanently impair the natural use and function of your pelvic organs, but for a short while you must be careful to avoid injury.

Nature's sign of warning is soreness. Until soreness has disappeared, prudence should be practiced, and the safest prudence is abstinence. From four to six weeks is usually necessary for the parts to return to their normal condition.

Some irregularity in menstruation may occur for a while. This should not lead to discouragement as the trouble will almost certainly correct itself.

No local treatment is necessary further than the use of a douche when necessary for cleanliness or comfort. It should be administered in the way it was given at the hospital. A good solution can be made by adding one teaspoonful of lysol to each quart of water.

For a period of two or three months, you should avoid excessive strain and fatigue. You should be prudent, especially at the menstrual periods. Avoid heavy lifting, straining, long standing, rough riding or driving, the use of the sewing machine, frequent going up and down stairs, and straining at stool.

The bowels should be regulated as far as possible by natural means, such as water, food, exercise and the establishment of a regular hour of going to stool. Mild laxatives should be used when necessary.

No unusual restrictions are necessary in the matter of diet.

On returning home you should remain quietly in the house for a week or ten days. Then begin to exercise by taking short walks and increase gradually day by day as your strength permits.

Tub baths are not injurious.

Please report your condition by mail at the end of three months. If you are well, the information will help us; if you are not well, we may be able to help you.

Such instructions are valuable, for they leave no doubt in the patient's mind and are likely to bring the patient back to the surgeon in the event of anything wrong.

After-care of Complete Perineal Tears.—When the tear involves the sphincter muscles and rectum, special care is required on the part of the bowels. The essential thing is to give a diet which will form little or no stool, e.g., fruit juices, strained broth, albumen water, tea and coffee, etc. On the second day after operation an ounce and a half of castor oil is given. When the patient feels the desire to empty her bowels, she is given an enema of olive oil or sweet oil followed by a plain enema of sterile water. All these enemas must be given through a small soft catheter, the catheter must be introduced with great care and straining must be avoided. This treatment is carried out every second day for two weeks, after which the bowels are moved daily with licorice powder or cascara. These patients should be kept in bed for three weeks. Restricted diet is kept up for three weeks and straining at stool must be avoided for at least one month.

Vesico-vaginal Fistula.—The after-care in these cases is of the greatest importance. Immediately on completion of the operation the bladder should be tested to see whether the sewing is secure. Fill the bladder with water or preferably a colored solution. If there is any leakage this should be attended to by proper suturing. A retention catheter should now be placed in the bladder through the urethra and the urine allowed to drain into a bottle on the side of the bed. The drainage must be carefully watched. If the urine stops flowing a boric acid solution should be gently forced through the catheter to dislodge any obstruction, and if this is not successful, the catheter must then be removed and cleansed. Once regularly each day, the catheter should be removed and cleansed and once each day the bladder should be irrigated with a warm boric acid solution and likewise two ounces of 1:1500 silver nitrate solution or 10 per cent argyrol solution should be injected into the bladder. When irrigating small quantities of fluid should be used, so as not to overdistend the bladder. The catheter should remain in the bladder for two weeks, and the patient must remain in bed three weeks. Sexual relations must be prohibited for at least three months. I have had one case that was injured by sexual relations two times after repair of a fistula. Drainage during the first few days is greatly aided by placing the patient in bed on her abdomen, but the position is very uncomfortable, particularly for a very stout woman and can therefore rarely be carried out for many hours at

a time. The routine plan of administering five grains of helmitol every three hours for three or four days after operation, I believe is of considerable value.

Vaginal Hysterectomy.—If packing is used, this should be removed after three days or longer. In order to remove packing, patient is placed on table or edge of bed with the thighs flexed. A narrow Sims' speculum is introduced into the vagina, and with dressing forceps the strip of gauze is grasped and carefully drawn out between the ligatures. No douches should be given until at least three weeks have passed, then a mild antiseptic douche may be used.

If silk or any nonabsorbable material has been used for ligating, these ligatures should be removed at the end of about three weeks, they can generally be removed by gentle traction at this time. The patient should remain in bed about two and one-half weeks after which time she must be instructed to gradually increase her movements. The patient should be warned against any heavy work and prolonged exertion.

Hemorrhage after Operation.—Occasionally hemorrhage follows the removal of the gauze, and if severe, must be given immediate attention. The patient is placed either on the operating table or put across the bed in the lithotomy position with a good light on the parts. The vagina is cleansed of all blood and a narrow bladed bivalve speculum is introduced to expose the bleeding point. Great care must be taken in separating the blades of the speculum in cases of perineal repair, lest great damage be done to the plastic work. If the bleeding point is found a small suture should be inserted and tied, if on the other hand bleeding comes from the interior of the uterus, this can be controlled by a firm pack properly placed in the vagina and counterpressure exerted with several folded towels over the lower abdomen. A many tailed bandage can be adjusted over these towels holding them firmly in place. This pressure can be discontinued after forty-eight hours and the vaginal pack carefully removed after the same period of time. If bleeding should reappear the operation of packing must be repeated. Haste and carelessness in packing are usually responsible for the failure. A carefully packed vagina will control practically every postoperative hemorrhage. The vulva is then protected with a sterile perineal gauze pad, and the patient placed in bed.

Pelvic Abscess.—The essential points in the after-care of pelvic abscess are continued free drainage and avoidance of irritation. If the case has been well chosen and a proper drainage tube placed,

drainage should go on uninterrupted. Irrigations through the drainage tube should not be carried on, since the force of the fluid may break through the abscess wall and cause infection of the peritoneum. Vaginal douches after the second day may be given if the discharge is offensive or irritating. The size of the drainage tube may have to be changed from time to time as the abscess cavity diminishes in size. If the tube becomes blocked, it should be removed, and a fresh one introduced. Much probing must be avoided. A tube must remain so long as there is a cavity to drain. The time of drainage varies from three to six weeks. Douches should be continued for several weeks after all discharge has ceased.

CHAPTER LXXX

SURGERY OF THE EXTREMITIES

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AMPUTATION

The chief aim in the treatment of amputation stumps is to obtain a useful and painless extremity. In an amputation of the upper extremity, the surgeon need be concerned only with the attainment of proper coordinated movements. When considering the lower extremities, however, the additional factor of obtaining an end bearing stump must be borne in mind. Sufficient attention has not been directed toward the achievement of attaining a weight bearing end; it is quite obvious that transferring at least part of the weight to the stump end would not only aid in function, but also lessen discomfort. However, the prerequisite to an end bearing stump, without doubt, includes early massage and exercise as well as early functional use.

Routine for Aseptic Amputation

1. **Bandaging.**—Sufficient gauze and cotton (Fig. 406) should be applied so that firm even pressure can be exerted upon the stump. A flannel bandage or towel will be found to exert a more even pressure (Fig. 407) than a plain gauze. As long as the wound is clean and free from discharge no drainage need be used.

2. **Immobilization.**—Since the chief requirement in rapid healing is rest, the limb should be immobilized for a few days. This immobilization can best be brought about by the application of some form of splint.

3. **Massage.**—Several days after the amputation, when the condition of the wound permits, gentle massage should be begun. At first it should be cautiously done for several minutes once or twice a day, increasing the force of the massage and lessening the time interval as the healing progresses.

4. **Pressure Exercise.**—The same principle applies here as in massage except that the pressure is not begun quite as soon. Begin by having the patient apply gentle pressure on a cushion for a few

minutes at a time, once or twice a day, increasing the pressure and lessening the time interval as the wound heals. When the patient is able to leave the bed, massage can partly be replaced by more positive pressure exercises. Gradually, pressure with the whole weight of the body can be commenced, and after a time, practice

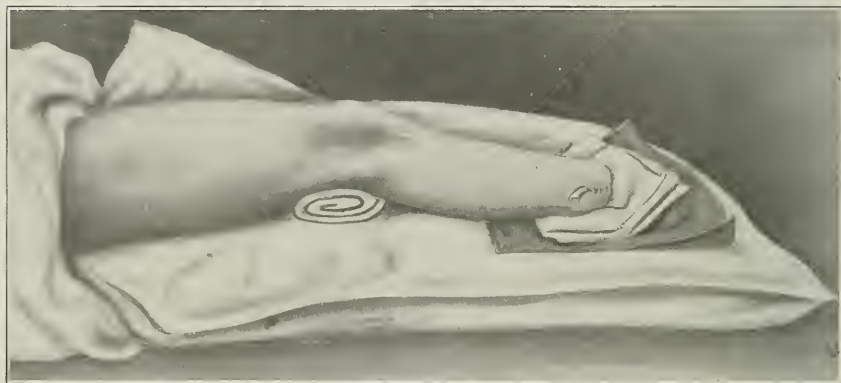


Fig. 406.—Dressings ready for amputation stump.

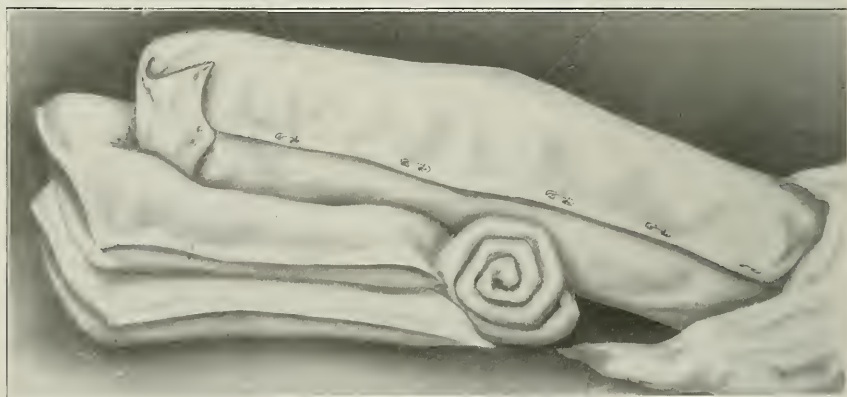


Fig. 407.—Towel bandage in place and stump elevated.

with the artificial leg. The aid of crutches should be dispensed with as much as possible, especially after the first few trials.

5. Movements.—After massage and passive movements, have the patient commence active movements. These should be undertaken in all directions but especially to counteract the contractures if they show signs of developing. In case of the thigh amputation, both active and passive movements should be carried out in extreme extension and adduction. If the contractures persist, splinting may

have to be resorted to, or a pad may have to be adjusted under the buttock and upper thigh to be left in position several hours during the day. In leg amputation, guard against permanent flexion at the knee by extension exercises. In upper arm amputations direct thorough exercise backward and in abduction. In the case of lower arm amputation guard against flexion and pronation in similar manner.

6. **Hydrotherapy.**—Frequent hot baths or packs will increase the circulation to the stump. The action of contraction and dilatation of the vessels brought about by alternately giving cold and hot baths have been advised for further increasing the circulation. Bier's hyperemia has also been found very useful.

7. **Encouragement.**—Throughout the whole period of treatment the patient should be offered encouragement in every respect. The mental depression resulting from the operation, the feeling of weakness and the inability to control movements of the stump may discourage him and interfere with developing control of the stump.

Affections and Complications: Their Treatment

Needless to say, an infected amputation stump is never sutured primarily. For this reason, as soon as the acute inflammation has subsided, continuous extension should be resorted to, to prevent shrinkage and contracture of the skin and soft parts. The Balkan splint as applied by Bryan¹ is very useful and efficient. Adhesive strips are applied around the stump to within one inch of the edge. Three strips are prolonged from points equidistant from each other on the stump and extended eighteen inches to an aluminum ring of eighteen inches diameter. Three ropes are attached from the ring to a beam and pulley on the frame so that when weight is applied over the pulley, the pull on each attachment to the ring is the same. The weights favored are eight pounds for the thigh and five pounds for the arm. The diameter of the ring thus gives ample room for dressing and cleaning up the wound. Free drainage should be provided for throughout the treatment. When the wound has cleared up, the bone can be cut off and the wound closed as in any amputation. The distinct advantage of this splint lies in the ability to apply the extension in any direction desired by moving the frame. Most serious affections of stumps do result from infection, but since those occurring in aseptic stumps can, and do tend to occur in septic amputations as well, the complications will all be considered together.

1. **Painful Stumps.**—This is probably the most frequently occurring affection both after septic and aseptic amputations. (a) Bulbous nerves may cause severe pain and can be removed by cutting away the scar tissue enveloping the end and ligating the sheath distal to the cut end of nerve fiber. Some surgeons advocate the nonremoval, as the bulbous nerves become painless in two or three months. Exception is made, however, in case of bulbous nerves developing late, they are removed. (b) Scar tissue, especially the abundant amount resulting from infection may envelop the nerve. In this case the scar tissue should be removed and the nerve freed. (c) Spurs of bone, developing from the new forming bone may grow out into the muscle and cause considerable tenderness. Their removal and the rounding off of sharp edges generally is sufficient. (d) Chronic abscesses resulting from the original infection may be very subtle if localized deeply under the skin, but should be incised and free drainage established. In case of obstruction of pus flow from any cause, recovery is delayed if it can be made to occur at all. (e) Osteomyelitis, periostitis and ostitis. The complication most to be dreaded is an osteomyelitis, especially in the case of severe suppuration, which tends to the ascending type. Osteomyelitis pains which are most apt to appear about the tenth day, should be watched for. The symptoms to be looked for are: pain in bone with or without pressure, pain on deep percussion, fever and constitutional symptoms of sepsis. The treatment will be considered later in the chapter.

2. **Sinuses.**—Sinuses most commonly result from necrosis, which always requires previous infection and sequestrization. An x-ray should always be taken and if a sequestrum or foreign body is present as may be the case especially in war wounds, it should be removed. Quite often after healing has taken place and sinuses result from the use of the artificial limb, the sequestra will be found to be enveloped with new-formed bone and will of necessity have to be chiseled out. The use of silk ligatures has very commonly been found to be the cause of a sinus and for that reason, of course, should not be used. Their removal is best attained by the use of some sort of hook rather than with a probe. In favorable cases where septic tracts are found in the scar tissue, excise the skin around the sinus, remove the septic tract with the surrounding scar tissue and sew up the wound. Packing with the intention of obtaining healing from the deeper parts of the wound will invariably leave a large puckering scar. If no local cause for the persistence of

a sinus is found syphilis should be suspected and treated as required.

3. **Ulceration.**—Ulceration may be due to a tight scar or irritation, especially when it occurs after use of the artificial limb has been undertaken. Obviously a bad fitting limb will cause ulceration and steps should be taken to correct the misfit. Very commonly the poor nutritional condition of the patient will be sufficient to cause ulceration following the slightest irritation.

4. **Bad Scars.**—Bad results may occur both from tight scars as well as loose scars. In case of tight scars with a too scanty covering of bone, which as already mentioned tends to ulcerate, skin extension is the best procedure. The scar is excised and a splint, as previously described, applied until sufficient extension has been produced. Only in rare cases will it be necessary to reamputate a portion of the bone. On the other hand if the scar and skin becomes too loose eczematous conditions are liable to result. It must be remembered that all infected stumps, after healing has taken place, shrink and produce a loose skin. Not until this shrinkage has taken place is a refashioning operation advised. Shrinkage can be accelerated in most cases by use of tight bandage and massage. In addition, the septic condition of the wound will not permit of a secondary operation previous to two or three months after the primary amputation. In a series of guillotine operations Huggins² found that practically all cases of resulting bone necrosis had been preceded by a secondary operation for shortening within two months of the primary one. Naturally, the patient will be in better condition to stand further operation if it is postponed, at least two or three months. In the refashioning, the scar is excised and the deeper portion also if there is too much covering for the bone. The skin can then be sutured to the tensesness desired.

5. **Joint Contractures.**—As already described, prophylaxis, in the form of movements and massage, reduces contracture. But if they have progressed beyond remedy by that method, the joint should be extended under anesthesia and a cast applied.

The antiseptic treatment required will not vary from the infected wound treatment which is described later in this chapter. In case of deep and persistent suppuration the Carrel method is most strongly indicated. Dichloramine dressings will also be found to be an effective antiseptic procedure.

As a final step before sending the patient to have an artificial limb fitted, it is strongly advised to have an x-ray taken and rule out as far as possible any chance of buried sequestra. If one is

present and not removed, the stump will almost certainly ulcerate when subjected to the irritation of the artificial limb.

Gangrene

1. **Diabetic.**—As has been shown repeatedly, the diabetic condition of the patient must be brought to a minimum before operation, or the occurrence of anesthetic death or diabetic coma is likely to result. Following the operation, in which the flaps are lying in opposition without tension and loosely sewed together, if sewed at all, free drainage should be allowed. In addition, the strictest asepsis is required on account of the excellent media produced by the sugar in the tissue and the poor vitality of the tissue, especially in the region of the operation. Antiseptics, however, are condemned and mild irrigation resorted to on account of the destructive action of the antiseptics upon the tissue. Without the development of infection the treatment is wholly directed in an effort to combat the appearance of the original condition. Antidiabetic treatment, including the administration of excess fluids, and sugar free diets are employed. Lymphangitis may come with the appearance of marked constitutional symptoms and death result in only a few days after operation.

2. **Senile.**—The same line of treatment as applied in diabetic amputation should be considered here except, of course, the anti-diabetic diet. The flaps which are best left unsewed are under no condition put under tension. In case of infection, irrigation, with application of drainage and antiseptic dressings is indicated. The limb should be slightly elevated to favor return flow and consequently more immediate healing. Throughout the postoperative course hygienic and constitutional methods are employed, chiefly to aid in the vascular impairment which was of course, also present previous to the operation. After circulation in the flaps has been established and union is progressing, the remaining sites of non-union can be sutured and the wound will heal without much further interference.

SURGERY OF THE BONE

Compound Fractures Treated by Operative Methods

1. **Primary Closure.**—The postoperative treatment of a compound fracture operated upon within several hours of the fracture naturally resolves itself into the treatment of a simple fracture. Being so



Fig. 408.—A useful method of producing traction.



Fig. 409.—A bone pin passed through the os calcis as a means of securing a high degree of traction.

treated, the wound can be closed and the limb put up in a cast or splint with comparative safety. If a cast is decided upon a sterile dressing is placed over the wound, the limb protected with cotton and the cast applied. The seat of operation is marked on the exterior of the cast and after five or six days an opening is made in the cast at this point. The opening is just large enough to allow taking out the sutures and inspecting the wound as well as the surrounding tissue. Any indication of pressure necrosis

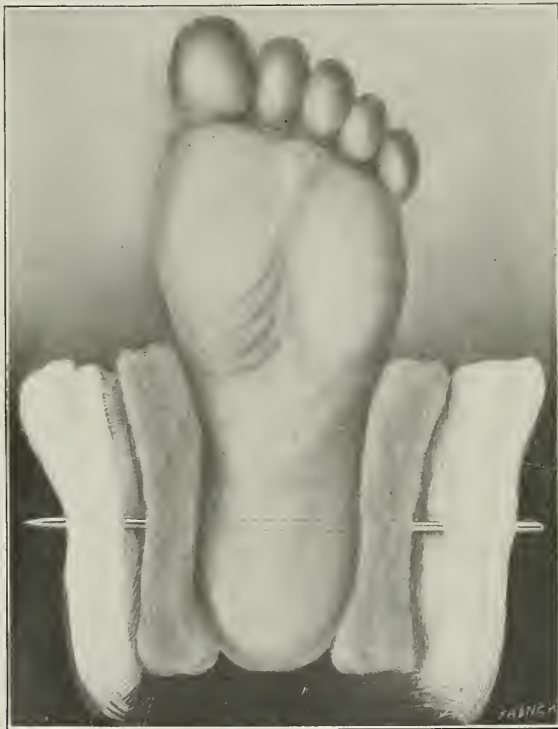


Fig. 410.—Showing protection of the soft parts in using bone pin traction.

should be remedied at once. At the end of one and one-half to two weeks the cast is split and completely removed for inspection of the limb. Gentle massage and passive movements of joints may be undertaken, but the cast should be reapplied and remain so one or two more weeks. Then, the cast is removed and active measure of massage and movements undertaken to restore the normal condition. In case splints have been applied, massage can be started within a few days after the application of the splints. Both active and passive movements should be instituted within

ten or fifteen days. A very important point is to prohibit all movements which cause pain or definite discomfort. Almost in every case of permanent immobility of the limb in the young the practice of early massage and movements has been neglected. An important factor to continually bear in mind is to apply all bandages and splints so that free movements of the parts are not possible during sleep, as a sudden unconscious movement may

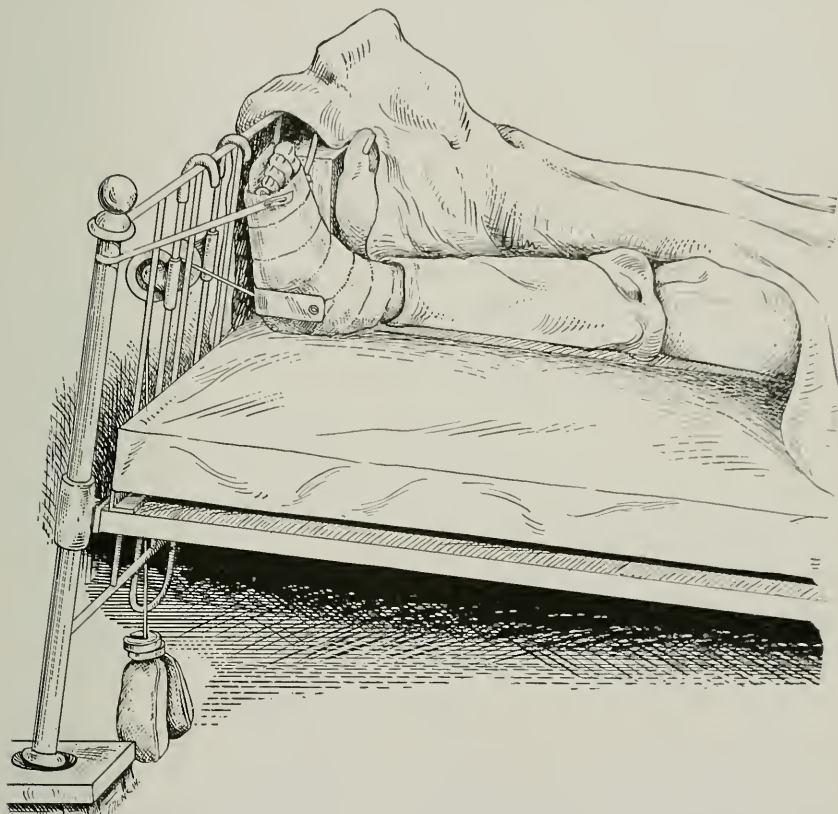


Fig. 411.—Sand bags attached to the bone pin and external rotation prevented as shown.

do severe damage to the bone union. Obviously the apposition of the bones should be watched from day to day to guard against possible displacements. If all these precautions are taken, very seldom will sufficient scar tissue develop to interfere with the proper movements of the limb. Traction where required may be secured as illustrated by Figs. 408-411.

2. Suppurating Cases.—In case the wound treated by primary closure breaks down with infection or the fracture is not seen be-

fore the infection has set in, several other factors must be considered, including infection and the development of osteomyelitis; both subjects of which treatment will be considered later in this chapter. Even in case of mild infection, massage and extensive movements should be deferred until the chances of spreading the infection are reduced.

3. **Ununited Fractures.**—The causes contributing to this condition are numerous, but the one occurring most often is the local condition of the interposition of soft parts between the ends of the bone. If present, union can be secured by cutting in, removing the interposing soft tissue and freshening the ends of the bone. Constitutional conditions, including syphilis, pregnancy, infectious diseases, prolonged illness, and anemia, may also be a factor in the nonunion. The treatment then is directed as much or more to the constitutional cause. Originally the practice of bone plating was used, but is gradually falling into disfavor. Bartlett,³ in a series of animal experiments showed quite conclusively the inadvisability of resorting to bone plating. The principle treatment of nonunion will be considered under bone grafting.

Affections of the Joints

Following the incision of an infected joint for drainage, the old conservative method has been somewhat replaced by a more active treatment. Willems⁴ reports favorable results with the immediate installation of active movements which serve admirably in expelling pus. Only in case the wound is not freely opened will the danger of spreading infection be sufficient to justify immobility. Motion also has additional advantage in aiding in the absorption of the periarticular exudate. The wound must be closed before the joint begins to dry out. With the installation of this method Willems reports but very few cases of ankylosis. Irrigation can be used, but unless free drainage is assured there is a possibility of spreading the infection. Hot dressings applied every two or three hours especially during the first few days will aid much in reducing the pain and discomfort of the patient. In involvement of the shoulder joint, the tendency for the infection to break through the capsule and extend down beside the biceps toward the elbow must be guarded against. Treating in abduction lessens the possibility of this occurrence. The treatment by active movements can be further supplemented by the use of massage, electricity and heat as a protection against ankylosis. Should ankylosis result gradual pro-

gressive force applied for a considerable length of time is advised. If stiffness can not be avoided, orthopedic surgery should be resorted to and the limb placed in the most useful position.

Resection of a joint is contraindicated except in unusually severe conditions. Following the resection and creation of the flail joint, e.g., of the elbow, the arm should be given full support in a flexed position and a cast⁵ applied for four or five weeks to allow contraction of the tissues. Massage and electricity are instituted to produce a more suitable tone in the muscles. Movement for some time should be limited to flexion and extension by application of lateral splints. These precautions will serve to limit lateral motion and aid in securing the best possible control of flexion and extension.

Syphilis and Tuberculosis

Only limited attention will be given to the postoperative treatment here on account of the necessary and important application of medicinal and hygienic measures. Persistent sinuses in tuberculous subjects are best treated by cautery applied to the whole surface of the sinus without injuring any more healthy tissue than necessary. Cautery with carbolic acid followed by application of 95 per cent alcohol and x-ray is resorted to with varied success. Ankylosis is a result to be expected in severe cases. Following the operation the foot is elevated to aid in return flow of blood and thorough drainage is instituted. At present, the question of the use of the direct sun rays in the treatment of unhealed tuberculosis lesions is receiving much attention. Reports are coming in showing favorable results with its use. Although much remains to be found out about it as a routine method, it certainly is worth giving a trial.

The postoperative cases of syphilitic lesions which do not show a tendency to favorable healing are best treated medicinally. In practically all cases, if proper use of mercury, salvarsan, and iodides is employed, the lesion will clear up and heal without difficulty.

Osteomyelitis

Osteomyelitis may be due to several causes, but usually it follows compound fractures or some direct injury to the bone, with a wound for a channel of infection. The acute form is more commonly met with in postoperative cases and will be dealt with more in detail than the chronic. The resistance of the patient as well as

the virulence of the infection determines the possibility and severity of the osteomyelitis. Observations show it is more likely to occur in children, especially those with maldevelopment or congenital malformation.

1. **Acute Form.**—The common method of entrance of infection in case of a compound fracture is through the fissures and cracks in the bone. From these fissures, the infection travels to the marrow and later to the neighboring surfaces by way of the haversian canals and forms subperiosteal abscesses. These usually burst through the periosteum and break through the skin as sinuses. The infection is usually limited to the diaphysis, but in rare occasions makes its way through the epiphysis line into the joint.

Symptoms.—During the postoperative stage, development of osteomyelitis should be carefully watched for. It commonly makes its appearance in ten to twelve days with a sudden onset. A sharp pain is felt in the neighborhood of the infected area: this pain is made more intense upon pressure and deep percussion. The soft parts become swollen, edematous, and red. The temperature is apt to be high—103 or 104 degrees and the pulse high in proportion. The leucocytosis will range from 20,000 to 40,000. Just before a sinus is formed a fluctuating abscess will be felt just beneath the surface. When sinuses are present, dead bone can usually be felt by introducing a probe, but on some occasions the sequestra may be situated some distance from the sinus.

Treatment.—Simmons⁶ favors early operation before the medullary cavity is extensively involved. A tourniquet should be used during the operation to prevent the distribution of the infective material as much as possible. The incision should be carried longitudinally through the sinus and down to the periosteum. If infected fissures and grooves are found these should be curetted out and enlarged. Trephine holes should be made in medullary canal each way from the seat of infection to allow of complete drainage, which is very essential. If dead bone is found, all of it should be removed. Infected marrow should be curetted, but care should be exercised to prevent both the spreading of infection by curettage, and removal of normal living endosteum. An emergency operation usually will inevitably have to be followed later on by a more extensive operation for removal of sequestra. Only in severe infections is the extent of operation limited. In these cases, after the severe infection has subsided the wound is explored extensively and drained. Frost reports favorable results with the use of iodine and picric acid

followed by dry dressings—only 23.17 per cent of long bone fractures developing osteomyelitis.

If this preliminary mechanical cleansing, and drainage fails, further operation is postponed several weeks, depending on the formation of the involucrum. In this operation the dead bone which is acting as a foreign body is removed, thus allowing the new-forming bone better opportunity to proliferate. After the necrotic areas have been removed, all trenches formed by the removal should, according to Jacob,⁷ be flattened out to allow cicatrization. Leave the wound open; packing being permissible for a day or so only to stop hemorrhage. Recurrence of necrotic areas should be watched for and the dead bone removed. In case of very severe suppuration, irrigation, preferably by Carrel-Dakin method is advised. If the destruction of bone has been very extensive, healing can be accelerated by bone graft after the wound is rid of its infection. Only in very severe cases with symptoms of septicemia is an amputation required.

2. Chronic Form.—Chronic form may follow operation for the acute, or be due to other causes, augmented by a variety of organisms, including *B. tuberculosis*, *B. typhosus*, pneumococcus and others which may be carried through the blood from some distant source. Although cases of multiple abscesses are sometimes seen, the infection is localized usually in the form of local abscess. The abscess may have been present without symptoms, from an original infection which had healed externally several months previously. A common site for them is in old amputation stumps occurring with the presence of sequestra which were not removed. Symptoms, especially constitutional, are less severe and the pains may recur from time to time until the abscess breaks through the surface.

If the abscess is diagnosed before the sinus forms, it should be incised and dead bone removed. The wound may heal up, only to have to be operated on later for a recurrence of the chronic process. This is especially liable to be the case if the process has extended over a year in duration. Extensive operations are contraindicated on account of the danger of spreading the infection and causing the formation of a very acute process. Much care and treatment with the generous use of irrigation and drainage is usually required.

Bone Grafting

Bone grafting is often employed as a secondary operation, especially since the work of Albee in 1911.

Indications for Grafting.—(1) Loss of substance. From osteomyelitis, or from resection due to presence of neoplasms. (2) Ununited fractures. (3) Desired ankylosis—either in vertebra or in relaxed joints. (4) Cases in which bone is congenitally absent. (5) Correct deformities.

General Principles Underlying the Operation.—1. *Asepsis.*—The strictest asepsis must be carried out throughout the operation. The seat of transplantation must be sterile and handling of the bone transplant should be done with sterile instruments and not with the hands.

2. *Autograft.*—A living autograft will give the best results. Homogeneous grafts have been used, best taken from a young individual, but with doubtful results.

3. *Hemostasis.*—The seat of the transplant must be free from blood and clots.

4. *Vital Tissue.*—Grafts do better if the periosteum, cortex and endosteum are all transferred together. The importance of periosteum and endosteum has been clearly shown by Brooks.⁸

5. *Contact.*—The graft must so fit the cavity made for it that the periosteum of the graft and shaft lie in close apposition. In addition, the greater part of the cortex walls must fit snugly together.

6. *Absence of Scar Tissue.*—Should scar tissue be present about the seat of the graft it should be carefully removed.

7. *Freedom from Injury.*—The graft should not be washed with an antiseptic or other solution, as the bone substance is destroyed by these methods.

Opinions differ as to the use of metal pins. Probably the plan as favored by Hodgson,⁹ if it furnishes sufficient immobility is the safer. He uses absorbable material, including kangaroo tendon and chromic catgut in binding the ends of the bone together. Albee's inlay has been found the most dependable for ununited fracture and also for most other emergencies, but an objection is made to the twin motor saw on account of the comparative small size of the graft for the cavity.

Intramedullary pegs are sometimes used, but not so extensively as a cortical graft. No drainage need be inserted in either method of grafting. Small narrow grafts have been found to be sufficient for reuniting a large bone, because the growth of the graft takes place in proportion to the function required of it.

Immobilization, in either case of grafting must be instituted for several weeks or months—five or six months on the average. Of course, gentle movements and massage are commenced long before this, to prevent contracture and ankylosis.

INFECTIONS

Perhaps no other phase of surgery has received so much discussion and had so much revision as has the treatment of infections in the years of the recent European War, during which the creation of antiseptics with a physiologic reason for their action has been observed. Even with the advent of our modern antiseptics, we still have to admit that success in treatment lies in no small degree in the toning up of the natural defensive mechanism of the human body. It is, of course, assumed that the discussion given, is aimed at infection developed following operation, whether acquired previous to, during, or after the operative procedure.

Stages of Infection.—These will be briefly considered because of the influence of the stage of infection upon the treatment.

1. *Preinflammatory.*—This includes the time, usually twelve to forty-eight hours following the operation in which there are no constitutional symptoms or local manifestations, including redness, swelling or discharge.

2. *Inflammatory.*—Local symptoms of swelling, redness, and pain, with the appearance of fever follow the preinflammatory stage. A thin foul discharge, reddish brown in color, appears but is replaced in a few days by a thicker purulent discharge.

3. *Suppurative.*—This, of course, in civil life is less commonly seen if the wound has been receiving proper attention and treatment. It is characterized by the continuation of the purulent discharge and the presence of necrotic tissue.

Methods of Treatment.—1. *Immobilization and Physiologic Rest.*—This is probably the most important factor in the after-treatment of infected wounds. The limb should be immobilized, preferably in an elevated position especially if the infection becomes severe. In this way the infection which travels principally by way of the lymphatics, whose flow is increased by motion, is given an opportunity to be walled off. A very striking illustration of the value of immobility¹⁰ is shown in the difference in the condition of the patient in the morning, after the rest in bed, and his condition by evening if he is allowed to be about as usual during the day. The fever will be found to be increased by the movements of the patient and the lesion will give evidence of spreading in extent as well as produce more pain. The practice of squeezing pus from a wound can not be too severely condemned. By this procedure the infective material is forced into new channels and the efforts of nature to wall the process off are defeated.

The processes of physiologic rest have very accurately been summed up by Crile¹¹. He advocates rest as applying to the living cell as well as to the muscular and psychic phases. The processes in the cell are disturbed by desiccation and also by the presence of undrained discharge. The irritation produced by unnecessary packs and bandages and by the effect of many antiseptics is to be avoided. Ill fitting splints and uncomfortable position are to be shunned. In exploring the wound the surgeon should use care and produce no unnecessary trauma with instruments.

2. *Hot Moist Dressings and Baths.*—As a prophylactic to prevent the further spreading of an infection, hot moist dressings have been found to be very useful. The solution used is composed of boric acid and alcohol. Although Prof. Kahlenberg reports the recovery of the boric acid in the urine, the antiseptic qualities can not be considered of much importance. Bichloride and solution of carbolic acid are contraindicated. The dressing is applied freely while hot and covered with paraffined paper. Openings can be left to allow of the resaturation of the dressing at intervals. However, as soon as the infection shows definite signs of subsiding, the hot moist dressings should be omitted, as continued application tends to make the tissues “soggy” and soft.

Analogous to the hot dressings are the so-called radiant heat baths, here the application is made only a few minutes once or twice a day. The temperature of the bath should be 150° F. or more. These baths are especially useful in case of small foci of infection preventing the performance of a secondary operation. If a sear is present it becomes inflamed after the course of two or three days and fluctuation can be elicited; the pus can then be evacuated and drained.

3. *Drainage.*—The old idea of drainage of an infected wound has been considerably modified; not that drainage is not essential, but rather it is the method of drainage which is to be condemned. The wound should be incised freely, resorting to counterincision, if necessary, and the small foci incised without injury to healthy tissue and free drainage allowed as the abscesses develop. However, in some cases of virulent infection, leaving a localized abscess undisturbed sometimes is very successful rather than exposing much healthy tissue to infection by the incision on account of the tendency toward decreasing virulence within the focus. The use of gauze as a drainage material is objectionable on account of accumulation of pus and fibrin within its meshes, which render it an effective plug. Soft rubber drain can be used, but care must be

taken that no areas of pressure necrosis result. Painting with drugs such as iodine has been found to be detrimental to proper drainage. Generally speaking, the important factor in drainage is the proper incision of the foci thus allowing free escape of fluid under tension.

4. *Antisepsis*.—As already stated, the antiseptic treatment is being supplemented by physiologic treatment, especially so, since the application of an antiseptic is accompanied by more or less undesired action upon the living tissue. Of the antiseptics and methods of application which have been given a rigid test four stand out as being the most effective.

(a) *Wright's Method*.—Although the action in this case is chiefly physiologic, the method will be considered here. By employing the use of a hypertonic salt solution of 5 per cent concentration, Wright has avoided the difficulty of neutralization of the antiseptic fluid by body tissue and the lack of penetration power. The effect is primarily physiologic in producing an osmotic process or reversing the flow of lymph toward the wound surface. The bacteria are thus carried to the wound and the chances of the increased infection much lessened. Moynihan¹² claims that with the use of Wright's method, the discharge becomes clear in a few days, and the granulation tissue formed has a deeper color and cleaner surface than when other antiseptics are used. Leucocytes are disintegrated and a ferment formed which is claimed to have some action on auto-digestion of the necrotic tissue, thus also eliminating the seat of growth of the bacteria. After the wound has cleared up, the hypertonic solution is supplanted by an isotonic solution, thus producing the migration of leucocytes to the wound which is further cleaned up by their phagocytic action. At the end of this time which is usually not over ten to fourteen days the wound is near enough sterile to be sutured up, and will heal by first intention.

(b) *Carrel-Dakin Method*.—The action in this case depends on the antiseptic action of a .45 per cent to .50 per cent solution of sodium hypochlorite. A marked disadvantage lies in the extreme care necessary in making up the solution, and keeping it from deteriorating after being made up. Moynihan is of the opinion that the action is, at least, due in part if not chiefly to the digestive action of the solution upon the necrotic tissue in the wound. The additional procedure of flushing the wound aids in cleaning the wound and thus prevents further spread of infection. Two methods of applying the Dakin solution are adopted: (1) flushing at two hour intervals, and (2) drop method. In the drop method, tubes with

only one terminal hole are used, whereas in the flushing method, tubes with many perforations are used. The tubes are placed in direct apposition with the wound and gauze applied only on top of the tubes at the opening of the wound, except in narrow wounds, in which case a small bit of towel is wrapped about the end of the tube. The tubes are placed with the perforation at the bottom of the wound, thus allowing of the irrigation of the whole wound surface. In case of the flushing method, 20 to 100 c.c. are used, depending upon the indications and size of the wound. The wound is sutured usually within two weeks of the date of the first treatment. The wound at this time is only "clinically sterile" and may contain a small amount of streptococcus, but closure will usually take place in the presence of those few bacteria remaining.

(c) *Morison's Method*.—Morison depends upon the action of a paste consisting of bismuth subnitrate, iodoform and paraffin, as applied to the surfaces of the wound. The method is employed most efficiently in cases of bone fracture and in cases where time for dressing wounds is limited. Of course, this would be likely to occur only in war surgery. Preliminary to the application, the wound is thoroughly cleansed by operation and all necrotic tissue removed. The paste is applied as a thin film on the surface of the bone and soft tissue, and the wound sutured. The wound is not dressed again for several days to a week. Dressing at this time usually suffices until the wound is healed. The success in the method evidently depends upon early operation and complete excision of necrotic material. Wounds treated without the paste, after thorough cleansing, seem to do practically as well as those in which paste is applied. Further objection lies in the fact that the application of the paste may occlude the drainage opening of a focus, and extension of the process take place into the surrounding tissue.

(d) *Dichloramine Dressings*.—The antiseptic in this case is supposed to form with the proteins of the tissue, a chloramine which acts as the antiseptic agent. It is used in 10 per cent solution and its supposed advantage over the hypochlorite is its length of action—being ten to eighteen hours, as compared with the thirty to sixty minute action of hypochlorite.

Two new antiseptics, proflavine and acriflavine, just recently introduced into use are claimed by Browning, to exert bactericidal action without injuring the living tissue. Their use, however, has not been thoroughly tested out and the claimed advantages still remain to be demonstrated.

5. *Hyperemia*.—(a) *Bier's Passive Hyperemia*. A constrictor of broad elastic material is placed high up above the infection. The bandage should not be so tight as to cause pain or cut off the radial pulse. When properly applied, the skin just below the bandage will be of a bluish red color and feel warm to the touch. Pain will as a rule be reduced. In acute cases the constrictor is left on twelve to fifteen hours of the day; in chronic cases only two to three hours. If left on too long a temporary edema may arise. The treatment has been used with very favorable results and is especially valuable in acute lymphangitis and after incision of acute abscesses. Its action consists in preventing the absorption of the toxins by reversing the flow of the lymph and causing it to flow into the open wound. (b) *Cupping*. This is another form of passive hyperemia but brought about by the use of various forms of cupping apparatus, the main principle lying in the production of a vacuum. The cups, which are usually made of glass, are applied directly over the limb or over the seat of infection with the intention of producing either a dry or wet cupping. The idea of dry cupping is to produce a passive hyperemia by drawing blood from deeper tissues to that spot. Wet cupping depends upon the removal of blood and serum from the wound, thus having the same physiologic action as a hypertonic salt solution. Although neither of these methods of producing hyperemia (by constriction and cupping) has been used as extensively as the results would indicate, they are of distinct value in the treatment of suppurative processes. Neither method of cupping is applied for very long intervals—usually several minutes at a time once or twice a day; the interval of application depending upon the wound, the vacuum force exerted, and the amount of pain produced.

The forms of passive hyperemia are usually supplemented by the use of active hyperemia also. A stream of hot air is directed against the infected area, thus producing dilatation of the vessels and also favoring the absorption of exudates.

(6) *Vaccines*.—Although this is a field still in its process of development, when it is combined with intelligent application it is a very remarkable factor in combating infections. The severe local reactions and anaphylactic symptoms which very commonly have resulted are considerably lessened by the use hypodermically instead of intravenously. However, the method as chiefly used now is more preventive than curative and the indiscriminate use of vaccines is to be condemned.

Closure of the Wound.—It is a well-known fact that wounds should never be closed in the presence of any infection. However, since a literal sterility of the wound is a condition hardly expected to be obtained, Carrel¹³ offers as a compromise a maximum of one bacterium per five fields allowed at time of closure. Closure of a previously infected wound is to be established as soon after the operation as possible on account of the lessened tendency for the formation of cicatricial tissue. The closure is brought about in one of two ways:

1. *Traction.*—In an ordinary wound mere pulling the walls together and holding them in place by adhesive bands is sufficient. Protection should be given the line of union by the use of some such material as sterile paper, etc.

Should there be extensive loss of tissue due to the operation or initial injury, continued elastic traction can be used with considerable success. A strip of adhesive tape with hooks sewed on down the midline, is applied on each side of the wound. Rubber bands are then used as lacing, and traction can be applied in any manner desirable to bring about the better approximation of the irregular walls of the wound.

2. *Suture.*—If the deep portion of the wound shows promise of poor approximation a few deep stitches with catgut can be applied and the defect remedied. Usually, more trouble will be experienced in getting the external surfaces together and in some cases the adhesions of the skin may have to be dissected up for a short distance to allow of sufficient stretching to make a proper approximation. There is usually no indication of employing the application of a drain.

Tetanus.—Although the cost of tetanus antitoxin hardly justifies using it in every case of an infected wound, an injection of 1500 to 2500 units hypodermically certainly is indicated in every case of contamination with foreign material, which has the slightest possibility of containing the spores. The value of antitoxin is clearly shown by Frost in a series of cases in which he reports a 65 per cent infection was reduced to 26 per cent and the mortality from 78 per cent to 31 per cent. The time for incubation in war surgery varies considerably, being all the way from ten to forty days: the mortality varying usually in inverse proportion to the time of incubation. On account of tetanus traveling by way of the nerves the distance of the wound from the brain will largely influence the time of incubation. In civil life incubation time is usually under ten days with a mortality of eighty to eighty-five per cent.

Symptoms in brief to be watched for are: headache, vertigo, restlessness, painful and difficult micturition, sharp pains about the wound and swelling. In a short time stiffness of the jaw or neck followed by tonic spasm of the muscles of the back, abdomen and extremities.

All peripheral and external irritation should be removed from the patient, by placing him in a quiet, darkened and well ventilated room. After the occurrence of lockjaw, feeding must be established by a catheter through the nose or per rectum. To control the convulsions, chloroform or morphine are used. Other drugs including potassium iodide, etc., are advised, but most of them, especially magnesium sulphate and carbolic acid by injection are of no avail. Obviously the prime factor of treatment lies in the use of antitoxin in large doses of from 5,000 to 10,000 units which are repeated every four or five days. Amputation of the affected limb has been shown to have no effect on the mortality even if it is done with the appearance of the symptoms.

Infection with Gas Bacillus.—Although infection with gas bacillus is a frequent occurrence in war surgery it occurs but rarely in civil practice and then only as a rule in postoperative cases of traumatized tissue exposed to external infection. Edema will first appear and the edges of the wound turn red or green, gradually becoming black. The skin peels off and an emphysematous crackle is heard upon manipulation of the limb. A fetid odor is practically always present. The infection spreads fast, systemic symptoms developing early in severe cases with coma and profound collapse, followed by death.

As treatment, the same factors considered for other infections are applied, but more radically. Immediate mechanical cleansing with drainage is resorted to but chemical preparations seem to have no practical value. In some cases, resection of muscle will prohibit the further spread, as the infection is limited primarily to muscle. If the condition becomes severe, amputation should be resorted to, and without awaiting a line of demarcation, for one, as a rule, never develops. Whether amputation is resorted to or not, heliotherapy¹⁴ should be used; hot air and artificial light resorted to if the sun treatment is not available. The mechanical effect of irrigation with some solution such as Dakin solution is always to be instituted. Throughout the treatment, obstacles to the circulation of the parts affected are to be removed. Incisions are to be made freely to allow sufficient drainage. A new development to be considered in

the treatment lies in the use of serums, which have received considerable attention by Weinberg, Lecloinche and Vallee.

Infections of Tendons and Fascia.—The same general principles regarding infections as already described, apply here, but some features are characteristic of these alone.

1. *Fascial Space Abscess.*—Special attention must be given to thorough drainage and immobilization to prevent the tendency for the infection to travel to joints and tendons. Hot moist dressings are applied but abandoned with the cessation of extension of the disease. Elevation of the limb and Bier's hyperemia are also especially useful. After danger of spreading the infection has ceased, active and passive movements should be begun to prevent adhesion to the joints or tendons. In severe infections additional complications of kidney and heart are liable to be met with in the form of nephritis and myocarditis. In such cases, dietary, hygienic and rest treatment must be instituted depending upon the condition present.

2. *Tenosynovitis.*—This complication is treated as is any acute process with especial attention to drainage, (preferably with as little artificial means as possible), immobilization, hot moist packs, hyperemias and irrigation—but never with strong antiseptics. With the infection in the upper extremity the hand is dressed with the finger in extension; Knave¹⁵ favors the use of a dorsal plaster cast with the wrist bent back on the cast which is bent dorsally at this point. The position and amount of extension are varied from day to day as the dressing is changed, to prevent possible ankylosis of the tendons or joints. After the acute stage of the infection has passed off, gentle active and passive movements are carried out in a bath of hot sterile water.

PERIPHERAL NERVE INJURIES

As is too often demonstrated, the identification of nerve injuries may be entirely postoperative; although of course the treatment will be identical, whether the injury occurred at the time of operation or preceding it. Such injuries present some of the most difficult problems we have to deal with, and probably the most careful and refined surgery possible, is called for. Again, we have been benefited by knowledge accumulated as a result of the recent European war.

Symptoms.—By the symptoms, of course, the type and locality of the injury are determined. Sensory disturbances are by no means

constant in appearance and extent, but if areas of anesthesia or perverted sensations are present, they point to blocking of the nerve supplying that region as well as determine the amount of pain, its distribution and character, the effect upon it of manipulation and its relation to other symptoms!

The trophic and vascular changes observed may present dry, scaly skin with the accumulation of cutaneous debris. These trophic changes, however, may not be due entirely to the nerve injury primarily, and may return somewhat to normal with the application of proper treatment.

Motor changes are quite characteristic if present but difficulty may be encountered in locating the lesion, thus demonstrating the value of having a complete anatomic knowledge. Paralysis and contractures may be present which in time tend to give way to atrophy.

By means of an induction coil the changes in reaction to electrical stimuli are determined. In case electrical phenomena are normal, indications point to a functional paralysis only, in which some trauma has affected the nerve though it still is intact. Paralyzed muscles will vary much in contraction, but usually have a slow relaxation time. After eight or ten days, reaction of degeneration is looked for, with absence of response to faradism and slow abnormal response to galvanism. In case there is loss to both galvanism and faradism, operation is indicated immediately.

Operation is usually postponed for some time unless directly indicated. In the first place, the wound if infected, must be allowed time to be made sterile. In addition, if repeated examinations show any definite signs of recovery, it is best to await further developments. However, it is obvious that if operation is definitely indicated, and no contraindications of bone involvement, etc., are present, the earliest possible operation must be performed.

It must be remembered that the result depends very largely upon the treatment before as well as after operation. Treatment is begun as soon as the lesion is diagnosed. The muscles are placed in a position of complete relaxation and all strain eliminated. Start massage of the muscles unless the area is inflamed as a result of infection. Tinel urges massage even in cases where considerable pain is produced. Special attention is given to the prevention of ankylosis of the joints. Every day the joints are subjected to passive movements in all directions. The treatment following operative procedures as described elsewhere in this chapter, resembles the preliminary treatment and much of it can be applied here.

Operative Procedures.—Before the surgeon considers operation, he must be very familiar with the anatomic structures in the whole field. Asepsis must be scrupulous both before and during the operation. The incision is preferably made above and below the site of injury, and carried down and up to the normal nerve. It then can be traced down to the site of injury in which the nerve may be dislocated or completely retracted. In case of musculospiral injury, Morton suggests completely reflecting the triceps from the humerus, instead of cutting through the outer head. A better exposure of the nerve is secured, as well as production of less damage to the muscle.

All handling of the nerve with the fingers is strongly condemned. A sufficient knowledge of anatomy should be in hand to enable the surgeon to cut down upon the nerve and not feel for it in the wound. Always grasp the nerve gently with forceps, never twist or stretch it in any manner. Dissecting the nerve away from its surrounding tissues should be limited as much as possible on account of cutting off the source of nutrition during the process.

Either one of two operations will be required: (1) neurolysis (removal of constriction bands of scar tissue) or (2) suturing of the nerve. In removing scar tissue always dissect the tissue from the nerve and not the nerve from the scar. If a complete severance is encountered, both ends are apt to be enlarged as result of scar tissue formation and outgrowing nerve fibers. If some fibers are intact, an effort is made to save them, but objections are that those fibers will be functioning poorly and can not be retained in proper position after suture of the remaining fibers.

If the severed ends of the nerve are found to require stretching it should be done before excising the cicatricial tissue, thus lessening the chance of injury to the nerve ends. The fibrous ends are grasped with gauze with slow and even traction applied. The fibrous ends are then incised and progressively cut off until examination with the microscope shows an absence of scar tissue. The cut ends are then brought into apposition, taking care that neither end is twisted any from the normal position, thus allowing the fibers to regenerate through the path of their original course.

If the nerve can not be brought together, a new and shorter path may be made for it or the nerve sutured during flexion of the joint, in which case the nerve path is shortened.

Before or after suturing, some surgeons resort to the application of some protective material. Various materials are used, including fascia, pieces of veins, and fat. Moynihan,¹⁶ however, expresses

doubt as to their value, and suggests the possibility of their being harmful by preventing the establishment of new blood channels to the nerve and by causing adhesions and compressions which are likely to affect the nerve. The safest procedure is to transfer the nerve to some uninjured muscle tissue where it will be free from contact with fascia.

In spite of stretching, there will be some cases in which the ends can not be brought together. The ways suggested, other than already described, include a nerve graft or creation of a flap and turning it down to meet the other end. These methods are largely experimental and as for being employed on humans should not be considered. Results as obtained so far have been very discouraging. One method, however, which can be resorted to is tendon transplantation. With proper transplantation function will usually take place as quickly as in a direct suture.

As already stated suture of the nerve should be accomplished without twisting either end of the nerve. Either a very fine fourteen or twenty day catgut or horse hair should be used as suture material. In all cases suturing only the nerve sheaths rather than piercing the nerve substance should be resorted to, unless the apposition is apparently too weak or blood clots interpose between the ends. However, Kennedy¹⁷ reports success in using horse hair as suture and piercing the nerve fibers, but only as a single through and through suture.

After-Treatment.—1. *Postural.*—Following the operation the limb is again put in a splint if possible, to relax the muscles. In case of musculospiral injury, in which the extensors of the arm, forearm, and hand are affected, producing wrist drop and supination, the arm is extended to relax the triceps; the wrist held in hyperextension and the arm in supination. Of course, in the condition where the joint has to be flexed, the joint must be dressed in this position and bandaged in such a manner as to prevent extension. The joint must remain flexed for a period of four to five weeks, with but gradual exercises toward slight extension in the latter period of that time. The leg or arm as the case may be is brought to extension gradually, after the union of the nerve has taken place; the length of treatment varying from several days to weeks, depending on the amount of ankylosis.

2. *Massage and Mechanical Treatment.*—Obviously massage should be instituted early, but in a gentle manner. The splints should be so arranged as to allow exposure of as much of the limb as possible. Attention should also be paid to the joints of the hand, utilizing

passive movements every day to prevent ankylosis. As the recovery takes place, active movements should be employed with the addition of exercise in some mechanical way in which use of the limb is encouraged in all directions and against some resistance.

3. *Electrical Means*.—The Bristow coil which is quite widely recognized is used for producing electric stimulation upon the muscle with the intention of maintaining tone and substituting exercise by the muscular contraction.

4. *Hydrotherapy*.—A hot bath or pack should be made use of especially just before massage on account of the softening of the tissue and increasing vascularity. Contrast baths with hot and cold water given alternately, are very effective in producing an increased circulation. Probably the most effective of the methods besides the massage, is the use of whirlpool baths. The use of these baths has only been installed of late, but Souttar and Twining¹⁸ report very favorable results. Heated water is driven by means of a pump through the baths and returned to the tank by way of gravity. For a hospital especially it is a very convenient method to operate. As a routine the patients are given a twenty-minute bath followed by a ten-minute massage. Freedom of joints and muscles after application of this method will be accelerated remarkably. Trophic changes it is said almost invariably disappear after a few days' treatment.

The results to be expected are, of course, measured considerably by the position of the lesion, as regards the distance through which it is required to regenerate. The trophic function will invariably return first followed by deep sensibility, tactile discrimination, motor power and cotton wool sensations in the order given. Marked recovery is usually noted in the musculospiral nerve in ten weeks; ulnar in twelve weeks; but in case of the sciatic several months are usually required. In case of failure to return to the normal, the possibility of functional disability must be considered and the defect corrected by orthopedic means.

VARICOSE VEINS

After the excision wound has been closed, a dressing is applied along the seat of operation in such a manner as to exert a light but even pressure. The constricting band if applied for the operation is not removed until the patient has been placed in bed. The extremity is maintained in an elevated position for about a week's time, thus aiding materially in establishing return flow through the

deep veins. It is lowered gradually during the next few days, and about fifteen days after the operation the patient is allowed to be up. A light bandage is generally applied before the act of lowering the extremity, especially in the morning. Should a mild edema result during the day it usually is removed by the night's rest, especially if the extremity is kept in a slightly elevated position. Excessive movements of it caused by the patient moving



Fig. 412.—Removal of dressings after varicose veins have been stripped out.

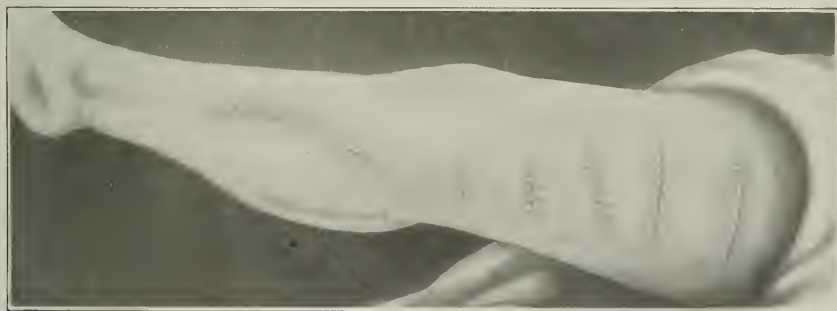


Fig. 413.—The appearance of the leg following multiple incisions for varicose veins.

about should be prevented as much as possible on account of the danger of resulting thrombosis.

With the presence of ulcers, the treatment becomes more complicated and recovery slower. If the ulcers are shallow and mild, all those not conveniently removed at the time of operation will usually clear up subsequent to it. Usually, the larger ulcers are undisturbed during the procedure unless their removal be necessary for complete excision of the varicose vein (Figs. 412 and 413). The patient should be kept in bed to reduce the edema, and the ulcer kept as clean as possible, while efforts are made to obtain the best

possible circulation of the parts involved. If no recovery is promised, the ulcers must be excised, the necrotic material and scar tissue removed, and skin graft resorted to to remedy the defect produced by the excision.

SKIN GRAFTING

General Principles.—For a good many years the practice of skin grafting has been used in plastic surgery and with varying results, depending upon the technic, but more especially upon the after-treatment. The prime success of the operation lies in asepsis both of the wound and during the operation. The graft should come preferably from the person himself, although grafts from other individuals may possibly have been used with success. The surface upon which the graft is to be applied must be free from blood, and if coarse granulations are present, these must be gently cleansed.

Methods of Operation.—1. *Reverdin's Method.*—The principle as advocated by Reverdin is to transplant small islets, preferably from over the tibia or thigh. The skin is thoroughly cleansed, a needle inserted into the skin, the epidermis and the graft cut off with scissors or with a knife held parallel to the surface. The grafts are placed on the raw surface at a distance of less than one centimeter apart, because observations show that spreading takes place with much greater rapidity when they are placed only several millimeters from adjacent skin.

2. *Thiersch's Method.*—The aim in this procedure is to cover the whole surface of the wound with grafts. After the skin is cleansed and put on the stretch in some manner, a razor is used to cut very thin strips including epidermis and part of the true skin. During the cutting process the skin is irrigated with normal saline. The grafts are applied on the raw surface with the edges of one graft overlapping the edges of the adjacent strip. The grafts are then gently pressed down upon the surface of the wound with some blunt instrument to insure complete contact.

3. *Wolfe's Method.*—An idea was devised by Wolfe of transferring a graft consisting of all the structures of the skin but using care in removing all fat and fibrous tissue from the under surface of the skin. The flap is cut slightly larger than the surface to be grafted to allow for the contraction. No sutures need be applied.

4. *Steele's Modification.*—This is a modification of Reverdin's method and as described by Douglas, Colebrook and Fleming¹⁹ in a series of operations in which they report considerable success,

consists in transferring small circular grafts containing the whole structure of the skin. The skin is raised up with a towel holding forceps and small grafts 6 to 12 mm. in diameter cut out by horizontal strokes of a knife. All fatty and fibrous tissue is removed before applying the graft to the wound. These grafts are applied as a Reverdin graft over the wound surface at intervals of 1 cm. or less for the same reason as already stated.

After-Treatment—Several methods of dressing the wound have been described, but all with the idea of prohibiting irritation as much as possible. Ochsner favors the use of no dressing whatever, but the application of a sterile wire cage over the area to prohibit contact by the dressings or bed clothing. Sterile bandages are applied over the basket in such a manner as to also hold it in position over the seat of operation. The wound is left undisturbed for six or seven days, after which time the dressings are removed. Throughout the whole course of healing, care is instituted to prevent any stretching or pulling of the wound on account of the ease with which the grafts may be detached.

Another method of dressing the wound is by applying a strip of tin foil directly over the wound. Light dressings are applied over the tin foil but exerting only slight pressure upon the wound. After a period of four days the dressing is removed and the foil lifted gently from the wound. If the graft has "taken," no tissue will come off with the foil; if the epithelial transplants have died the necrotic epithelial cells will come off in patches indicating the necessity for fresh grafts.

In case of suppuration or suspected infection a more satisfactory covering consists of oiled fabric with numerous perforations to allow of drainage and the escape of the ferments which would lead to the disintegration of the epithelial cells. This oiled fabric which is called "Perforated Parex Protective," is sufficiently supple to fit all the irregularities of the wound and allow the escape of the discharge. If the grafts have survived and have been properly treated, they will be healed over forming a smooth surface in the course of two or three weeks.

Full credit is due W. H. Cole for having abstracted all the literature to which reference is made in this chapter.

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CHAPTER LXXXI

POSTOPERATIVE TREATMENT OF ORTHOPEDIC PATIENTS

By M. S. Henderson, Rochester, Minn.

Orthopedic surgery may be arbitrarily divided into operative and nonoperative orthopedies, but there can be no sharp line of demarcation drawn. In considering the postoperative treatment of orthopedic cases, it must be understood that not only the immediate postoperative care is to be considered, but also that later treatment which embodies the principles underlying the nonoperative phase of orthopedic surgery, consisting of such measures as adequate fixation by splints, or plaster, the degree of active and passive motion to be permitted, and the amount of weight bearing. That patients may finally secure the best possible result following operation they must usually be carefully guided and cared for through months, during which the principles underlying nonoperative orthopedies may be utilized. It may readily be seen that it is absolutely imperative the surgeon undertaking operations of this type should be willing and qualified to maintain such rigid direction and care of the patient.

The operation, strictly speaking, is finished when the skin is closed, but at this point, and before the patient leaves the operating table, in most instances, the postoperative care begins. If this is not properly conducted, an otherwise brilliant operation may end in a dismal failure, the patient will be bitterly disappointed and the surgeon discredited. Adequate postoperative fixation is just as necessary in congenital dislocations, of the hip, club feet, united fractures, bow-legs, knock knees, and osteotomies, etc., as the operation itself. The manner of securing such fixation differs occasionally, according to the individual ideas of the surgeons. The methods herewith described have been found satisfactory in the orthopedic division of the Mayo Clinic. Changes are constantly being made and what is herein stated as satisfactory may in a short time be changed. No claim is made that they are the only means which may prove satisfactory.

Pain.—Pain, in many instances, is severe and demands relief. Morphine may be used even more freely for relief than following operations on the abdomen, for the inhibiting action on the

intestinal peristalsis is not so important. Often a combination of codeine sulphate and aspirin will be sufficient. In babies and young children, paregoric may be freely given, and probably is for young patients the most suitable analgesic in use. Most patients, particularly adults who have had some long standing deformity corrected, such as a flexed and abducted hip, will experience great pain in having the limb held in abduction. Following such an operation the muscles, fibers, scar tissue, and nerves are all on a stretch and pain is persistent, necessitating morphine for from three to five days. Careful attention to the position in bed, and occasional slight changes in position, will relieve the patient.

Complications.—The complications do not differ greatly from those in other surgical cases. Postoperative pneumonia fortunately occurs but rarely. There is no record of a clear-cut case of pneumonia following an orthopedic operation in the Mayo Clinic. It would seem that the further away the operative field is from the upper abdomen, the less chance there is of pneumonia.

Except for the temporary nausea due to the anesthesia, gastric disturbances are rare. In a large general surgical clinic, gastric lavage is not infrequently necessary for the various degrees of dilatation of the stomach that may ensue after the operation, but in orthopedic patients this gastric dilatation is fortunately conspicuous by its absence.

Shock also is a very rare occurrence, but may follow operations for old ununited fractures unless the hemorrhage is controlled. In operations on the femur, if protracted, and with considerable loss of blood or in patients debilitated by sepsis the dangers are particularly great.

Recently our attention has been called to fat embolism as a complication (Bissell). Operations on the bones had been thought to be especially productive of this disaster but Bissell has shown that it occurs under many other conditions. Surgeons are as yet helpless in the face of this unfortunate accident. However, investigations will undoubtedly be conducted during the war, whereby some means may be discovered to combat the condition.

Diet and Medication.—As soon as the disturbances following operation are over, the patient should be put on a normal diet. In debilitated persons, particularly those suffering from tuberculosis of the joint with a more or less quiescent pulmonic lesion, the diet should be especially nourishing and sustaining, with plenty of good milk, buttermilk, cream and butter. Fats should be forced as much as possible and cod liver oil in some form should be pre-

scribed; unfortunately, in tuberculous persons, there is occasionally a marked aversion to fats and very seldom do they voluntarily take to such a diet. The formula of a preparation which has been used with more success than any other is given herewith.* The emulsion should not be given in advanced cases in which there is high fever, diarrhea, etc. Syrup of the iodine of iron is also very beneficial. Tonics definitely play their part in the care of tuberculous and debilitated patients and they should be administered judiciously.

Fresh Air and Hygiene.—Fresh air should be insisted on, and as soon as may be done safely, the patient should be allowed to be up and about either in a wheel chair or on crutches. Physiologic rest for the part under treatment is essential, but this does not mean necessarily that the patient must be confined to bed. If he is strong and robust, confinement to bed will not be detrimental, but if, for example, a patient has tuberculosis of the knee, unless such rest in bed can be conducted with the maximum of fresh air, good food, and mental compatibility, he is usually better off if allowed to be up with some form of fixation for the affected part. On the other hand, it is a clinical fact that union occurs more rapidly in ununited fractures and in resected knees when the patient, if not confined to bed has been kept at least very quiet, for from four to six weeks. Immediately after the operation, rest should be maintained at least until the blood-clot in the operative field has organized.

Fixation.—In this country, plaster of Paris has been used by most surgeons to provide postoperative fixation. Properly applied, it makes an ideal dressing for this purpose. Robert Jones of Liverpool uses splints almost exclusively made of ordinary sheet iron. In his skilled hands, these are remarkably efficient, but unless the surgeon is adept in their use, he is apt to be disappointed. A plaster of Paris cast applied with attention to details, such as, how far it shall extend, the padding, especially of the bony prominences, and the careful rolling on of the bandages to avoid constriction, makes a permanent dressing that can be left on in clean cases for weeks or even months. The objection is frequently raised that the oozing of blood from the wound (which is unavoidable to a certain extent), soaks through the dressing and into the cast, decomposes

*Formula: Egg Emulsion:

Vitell.	No. 4	Ol. Amygd. Amar.	MX
Glycerini	5III	Ac. Phosphorici Dil.	5I
Ol. Morrhuae	5VI	Spt. Vini Gallici	5I
Ol. Gaulth.	5MX	Vini Xerici qsad.	XVI
		Dose,	

Add glycerin to yellow of eggs, triturate gradually, add oil of morrhuae until thoroughly mixed, then add oil of bitter almonds, oil of gaultheria, and then oil of phosphoric acid gradually, then spirits of vini gallici and sherry wine.

and makes a disagreeable odor that is offensive to the patient and attendants. This is true, but if a little oil of wintergreen is put on the edges of the cast frequently the foul odor will not be noticed, and usually in from seven to ten days the exuded blood will be dried and the odor greatly lessened. If the odor continues to any degree beyond this time, it usually means that the bleeding has kept up or that infection has occurred. The patient and the attendants are apt to insist that the cast shall be removed, but if it is kept on for from seven to ten days and the odor is less, the patient will then be willing to leave it on until such time as the surgeon deems it advisable to remove it. While the patient is still on the operating table, after the cast has hardened sufficiently, an opening ordinarily called a "window" may be made in the cast large enough through which to dress the wound. This window need not be lifted

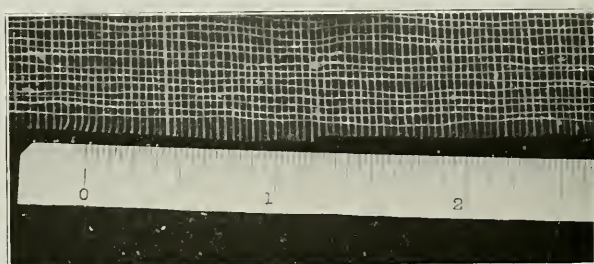


Fig. 414.—Starched crinoline of a mesh 24 to the inch.

out, but may be left in place and held firmly down by wrapping an ordinary gauze bandage around it.

Plaster of Paris bandages bought on the market are notoriously unreliable, and the only sure way to get reliable bandages is to have them made in comparatively small lots and kept in air-tight tin cans. Starched crinoline (Fig. 414) of a certain mesh, 24 to the inch, is very well suited for the bandage material. Just enough plaster should be spread over as the bandage is rolled to fill the meshes. The bandage should be smoothly, evenly, and firmly, but not tightly rolled. Each bandage should be wrapped in Japanese paper to prevent the loss of plaster of Paris. To insure the best results the plaster of Paris used should be the best grade of dental plaster.

A good plaster of Paris cast cutter (Fig. 415) is of aid in the removal of a cast which has been on for some time, and should be included in every plaster of Paris outfit (Fig. 416). A comfortable

sacral back rest, such as that designed by Meyerding, is a great help in putting on certain types of casts, for example, a plaster of Paris spica.

If the plaster of Paris cast is carefully applied, particular at-

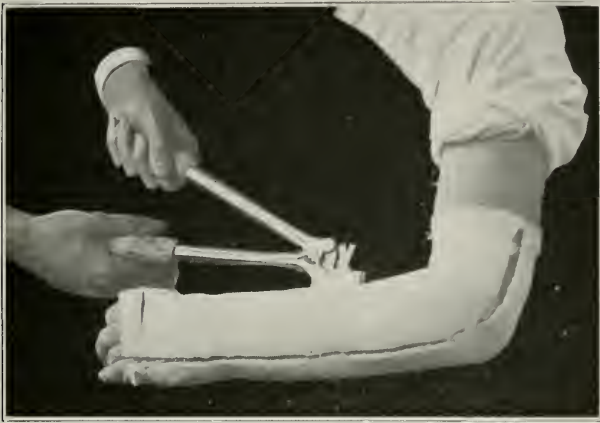


Fig. 415.—Plaster of Paris cast cutter.



Fig. 416.—Leg rests, plaster of Paris pail, back rest, knife, and scissors.

tention being taken to see that the bandages are not rolled on too tightly, and that the proper padding is placed beneath the cast, there is little chance for constriction to occur. In many instances it is probably much safer to cut the plaster of Paris cast its full

length just after it sets. This can best be done by a plaster of Paris cast-knife. It is better to continue this incision even down to the dressing and to the bandage, for if the bandage is too tight, merely loosening the cast will not remove the constriction. The surgeon who is accustomed to applying many plaster of Paris casts will probably not find this step necessary.

Outing flannel makes very nice padding, and while more expensive than sheet padding, is in the end more satisfactory. For the bony prominences, some good grade of saddler's felt may be used. Before putting on either the flannel or plaster bandages the ends should be cut transversely (Fig. 417) to cut any loose threads that may ravel as the bandage is applied and necessitate pulling rather hard to unroll it. If necessary to pull the bandage to break these threads, the bandage will be applied too tightly and unevenly,



Fig. 417.—Cutting the loose threads of the plaster of Paris bandage.

and constriction will later occur. This undoubtedly is the cause of many plaster of Paris casts being put on too tightly. The bandages must be loosely applied and the plaster made to conform to the shape of the part by continually rubbing and fitting them as they are put on.

For a smooth covering just over the skin, stockinet in various sizes is very convenient, and agreeable to the patient. The ends of this stockinet may be left to project beyond the edges of the cast, and when the cast is applied the stockinet may be pulled over the edge and held there by the last plaster of Paris bandage, thus giving a round smooth edge to the cast. To give the cast a better and more permanent finish gluten bandages may be applied as a final covering. It is more or less waterproof, and in young children prevents staining and softening of the cast by the urine and excreta,

In many cases braces are essential to some part of the treatment. The function of a brace is not to correct a deformity, but merely to prevent the recurrence of the deformity after correction, and it should be worn only until such time as the part will remain straight without any appliance. In some instances the brace must be worn indefinitely.

The types of braces are comparatively few for ordinary operative orthopedic cases and need not be expensive. The modified Taylor brace (Fig. 418) is perhaps the most efficient of the back

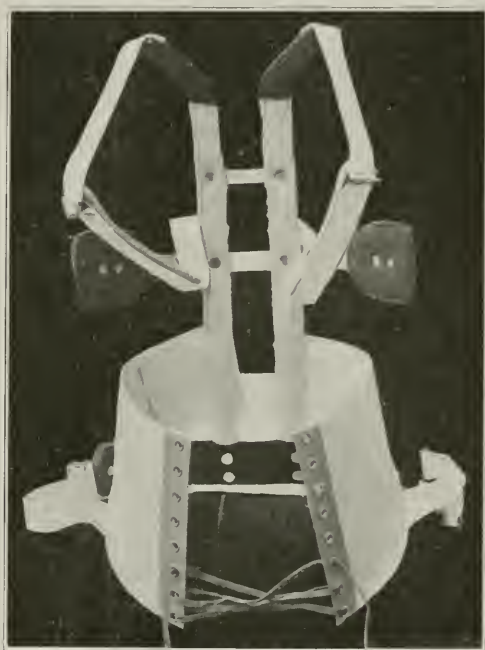


Fig. 418.—Modified Taylor back brace.

braces. In cases of foot deformities after operative correction, it is desired to throw the weight of the body either on the outer or the inner side of the foot. The weight is thrown on the inner side after a club foot operation, by placing an inside iron extending from the shank or heel of the shoe to the calf with a band about the leg. The outer side of the sole and heel is raised a little and an outside T-strap is applied to pull the ankle over to the upright, thus tending to put the foot in a valgoid position (Fig. 419). If on the other hand after an operation for pronounced flat foot the weight in walking is to be thrown on the outer side of the foot, the arrangement is merely reversed by placing the iron upright on the outside,



Fig. 419.—Braces for club feet throwing weight on inner side of foot.



Fig. 420.—Stiff-legged brace.

raising the inner side of the sole and placing the T-strap on the inner side to pull the ankle to the upright thus tending to place the foot in a varus position.

The stiff-legged brace (Fig. 420) is very useful when fixation is to be given. It is not necessary that this be worn at night. Muscular atrophy is less than when a cast is worn, and massage may be readily given. A gutter plaster of Paris cast answers the same purpose and is much cheaper, but does not last as long as the brace. The stiff-legged brace may be used to great advantage for patients with resected knees when bony union is not yet complete, and the

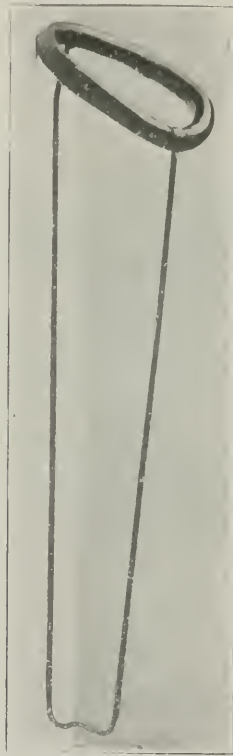


Fig. 421.—Thomas extension knee splint with properly shaped ring.

weight-bearing, if permitted with protection, will hasten solidity. The Thomas knee splint so much used by Robert Jones has the advantage of both fixation and extension. The ring at the upper end must be made properly accurately to fit the thigh and to obtain its fixation-point on the tuberosity of the ischium (Fig. 421). The ring is irregularly ovoid in shape, flat in front to correspond to the groin, expanded behind, and wider on the inner side to correspond to the buttock. If the splint is to do its work, this ring

must be properly made and padded. Ridlon gives an excellent description of this.

The Jones abduction frame is a very useful brace that may be employed in certain instances following operation on the hip when abduction is desired (Fig. 422). This brace has the advantage, particularly in children, that abduction and extension may be maintained without a plaster of Paris cast, the opening in the frame permitting the care of the patient so that soiling will not occur from the excreta. The patient may also be carried about, and placed in the open air and sunshine, with very little inconvenience.

Physiotherapy.—A great deal can be accomplished by physiotherapeutic measures in postoperative orthopedic cases. Massage,

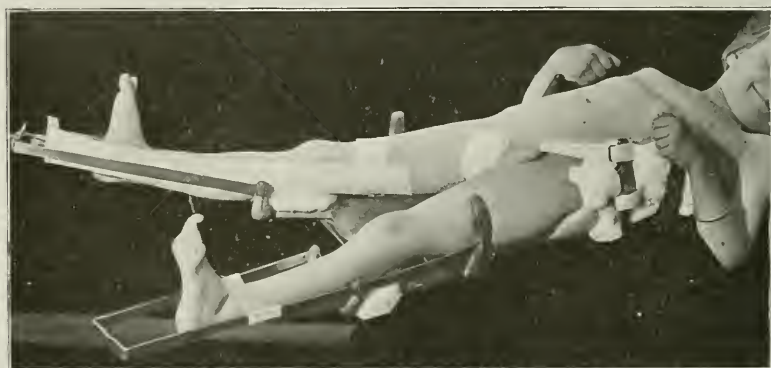


Fig. 422.—Jones abduction and fixation frame for the hip.

baking, and muscle training, are almost essential. Electricity is of rather doubtful value, although it must be admitted that occasionally the psychologic effect is probably well worth the time consumed in its use. Encouraging and stimulating the patient to use the weakened, stiffened muscles is very important.

Fractures

The principles underlying the postoperative treatment of fractures are practically the same, no matter what the type of operation may be, whether bone grafting, application of a Lane plate, or simply an exposure and alinement of the fragments by placing them in contact. There must be sufficient fixation to maintain the apposition and alinement. This postoperative fixation is easier to obtain when a Lane plate or some firm internal splint has been applied; these naturally keep the fragments in line. Plaster of

Paris is here the most useful agent for external splinting but in certain instances fixation by extension is better. When the operation has been completed, a fairly large dressing is placed over the wound and a plaster of Paris cast applied. When the plaster is nearly set, a window, the full length of the incision, should be cut in the cast. This window need not be removed but should rest there, and an ordinary gauze bandage should be applied over the whole to keep it in place. At the end of two weeks, this window may be easily removed and the stitches taken out. As soon as practicable, roentgenograms should be taken to see that the position is good. As has been stated, a little oil of wintergreen may be sprinkled about the edges of the cast when the odor is due to decomposed blood.

Fracture of the Tibia.—Since delayed union is relatively common in fractures of the tibia, operative procedures are often necessary.

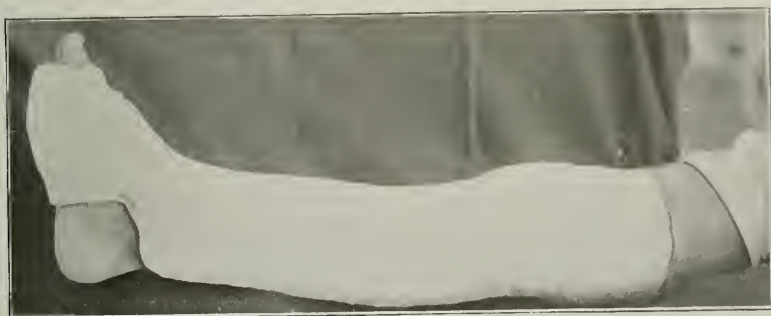


Fig. 423.—Plaster of Paris cast applied for fracture of the tibia. No pressure on the heel.

The application of a plaster of Paris cast as has been outlined, should be carried out. The cast should extend half way to the hip, and include the foot. It is not necessary to put the plaster over the heel; it should be stopped well up on the tendo Achilles, and on the foot it should be stopped posteriorly at the insertion of the plantar fascia (Fig. 423). If the cast covers the heel and the padding is not exactly right, the patient will often complain more of pain in the heel than from the operation. The footpiece of the cast should extend down from the heads of the metatarsal bones, leaving the toes free. It should be borne in mind that as the reparative properties of the bones are below par, union will necessarily be a little slow, no matter what method of treatment is used. Stitches may ordinarily be left in for three weeks, when a new cast may be ap-

plied which should be worn from eight to ten weeks longer. A gutter cast may then be made from this, and light massage instituted. The time may be materially shortened in fresh fractures, union usually occurring in from six to eight weeks. There can be no definite time set as to the period necessary for fixation, as each case is a law unto itself. As soon as union is firm enough to permit, active motion should be instituted and increased as rapidly as possible. The too early institution of passive motion, and the too frequent examinations to ascertain whether or not union is firm, in many cases are productive of great harm and the cause of non-union. If the fracture is not united after a normal period, fixation should be provided for at least three weeks longer, and at the next examination if delayed union is still found the manipulation should not be too vigorous, for by rough handling the little callus that has formed may break down, and nature is then very reluctant to throw out new callus. If delayed union persists, it may be wise to use the coffer-dam method of Thomas, that is, placing a rubber band above and below the fracture, and then pounding the congested area between these bands with a soft rubber mallet. The patient should be encouraged to use the leg moderately, to produce irritation.

Pott's Fracture.—Operative measures, as a rule, are not necessary for recent fractures of this type, but occasionally a patient presents himself with an old Pott's fracture firmly united with the foot in a marked valgoid position. The statement is often made by the patient that the ankle appeared to be perfectly straight until he began walking on the foot, when the deformity gradually became noticeable. If this happens it will be necessary to perform an osteotomy of the malleolus of the tibia and also of the malleolus of the fibula, and forcibly correct the position, shoving the astragalus over into its proper place. The foot is then forced up into dorsal flexion and inversion and a plaster of Paris cast is applied in this position, which must be maintained for approximately eight weeks. The first cast must be left on for three weeks, when the stitches should be removed, and a new cast applied. Before any weight-bearing is permitted, the shoe should have the inner side of the sole and the inner side of the heel raised for at least half an inch, and an outside iron with an inside T-strap should be provided in order to throw the weight on the outer side of the

foot and to prevent any recurrence of the valgoid deformity (Fig. 424). This form of apparatus should be provided for all patients recovering from a Pott's fracture, regardless of whether or not they have been operated on. It will tend to prevent the supervening of the valgoid deformity.

Fracture of the Shaft of the Femur.—One of the most difficult operations in the whole realm of surgery is that for an old mal-united or nonunited fracture of the femur. It is absolutely essential in such cases to provide proper postoperative fixation, otherwise an operation which has entailed considerable risk to the patient



Fig. 424.—Outside iron, inside T-strap and raised inner side of sole to use after Pott's fracture.

will have been done for nothing. Operations of this type are attended by a higher mortality than like operations on other bones and should be undertaken only by experienced surgeons. The plaster of Paris cast should be a spica, embracing the pelvis and extending down below the knee. Later in the patient's convalescence this cast may be shortened to the knee (Fig. 425). Weight-bearing should not be permitted in these old ununited cases under six months as the reparative processes are very slow. It is wise to leave the knee free as early as possible (never under five weeks)

so that the patient may work it and prevent the stiffness which so often follows in these cases. Also the little function this allows induces the deposition of bone-salts in the fractured ends more rapidly. Osteoporosis must be guarded against as much as possible and this is best accomplished by moderate use of the leg with no weight-bearing.

When practicable the cast should be split in order that massage of the quadriceps muscle may be carried out, care being taken that the massage is not so vigorous as to disturb the callus.



Fig. 425.—Short spica cast.

Fracture of the Neck of the Femur.—It has been erroneously stated, and so frequently that the impression has gained ground among the profession as well as the laity, that nonunion is more or less to be expected after an intracapsular fracture of the neck of the femur. The old classification of intracapsular and extracapsular fractures of the neck of the femur is one which does not

stand clinical use. Practically every fracture of the neck of the femur is both intracapsular and extracapsular because the capsule extends a short distance only on the posterior surface of the neck of the femur, whereas on the anterior surface, it extends well down to the trochanter.

The method of Whitman is gradually coming into its own. This consists of anesthetizing the patient and then establishing strong extension to obtain normal length and abduction of the limb with the foot in the normal position which causes the impaction and retention of the fragments. Cotton advocates the same with the addition that he hammers with a mallet the trochanter with the limb in abduction, thus forcibly impacting the fragments. The plaster of Paris spica extending from the chest to the toes is applied immediately the fragments are placed in such position. The patient's bony prominences must be carefully padded as this cast will have to be worn for some time, usually not under three months. No weight-bearing should be permitted under six months.

The cases of nonunion in fractures of the hip are unfortunately more common than they should be, and surgeons are called on to operate in these cases in an attempt to obtain union. The operation may be done by various methods, but some form of bone grafting is probably the best in use at the present time. After this operation a plaster of Paris spica must be applied as previously outlined. A window may be left over the wound so that at the end of two weeks the wound can be inspected and the stitches removed. Here again the length of time for wearing the cast can not definitely be estimated except that three months is usually the minimum, and there is no weight-bearing for six months. Weight-bearing may be best avoided by raising the sole and heel of the shoe for the sound limb four inches and providing crutches. Roentgenograms should be taken each time the cast is changed, since this is practically the only way in which to determine whether or not callus is forming. The degree of function allowed depends entirely on this factor. As soon as practicable and safe, the spica cast should be shortened to extend to the knee only. This will prevent the stiffness of the knee-joint which so frequently follows the prolonged wearing of a long hip cast. Weight-bearing should not be permitted until roentgenograms show that union is complete. If this is not evident to some degree in six months, the operation may be called a failure.

Fracture of the Humerus.—Fractures of the shaft of the humerus occasionally fail to unite, and a false joint develops. Operation is

the only hope of cure, many cases reported having persisted for five, ten and even fifteen years. While the operation itself is often quite difficult, that of bone grafting, in recent years, is the recognized



Fig. 426.—Plaster of Paris body cast with trough for arm incorporated in the cast.



Fig. 427.—Cast worn by patient three months. The anterior portion which covered the arm has been removed before taking an x-ray.

treatment. The chief difficulty in such cases is the postoperative fixation, and this may best be controlled by a plaster of Paris spica cast embracing the thorax, the shoulder on the affected side, the forearm, and a support for the hand, to hold the wrist in moderate extension. Probably the best manner of obtaining fixation for a fracture of the humerus that is to be operated on is to apply a body cast a few days before, building on to it a ledge of plaster of Paris running transversely across the front of the cast about the level of the costal margin and extending up behind the arm to the axilla (Figs. 426 and 427). After the operation the arm can be placed in this trough or rest and be firmly held in place by fresh plaster of Paris bandages over the entire arm and forearm. This cast must be worn until union is known to be firm, as evidenced by the clinical examination and the roentgenogram.

Fracture of the Forearm.—Radius and Ulna.—The plaster of Paris cast, to be applied after operation on the radius and ulna

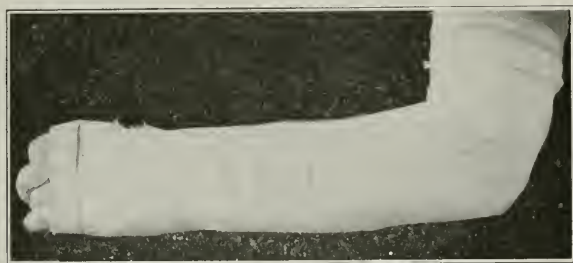


Fig. 428.—Plaster of Paris cast for fracture of the forearm.

should extend down onto the hand as far as the heads of the metacarpal bones and should allow the fingers and the thumb to be free. The cast should extend well above the flexed elbow, the forearm being held midway between pronation and supination (Fig. 428). As early as the fifth or sixth day, moderate movement of the fingers should be encouraged, as it prevents adhesions, and fibrous ankylosis of the joints of the fingers.

Excision of the Knee Joint.—Excision of the knee is performed most frequently for tuberculosis. It may, however, be done for a flail joint following infantile paralysis, for chronic infectious arthritis, or gonorrheal arthritis, but whatever the etiology of the condition demanding the excision, the after-treatment is the same. Ankylosis occurs more slowly in the tuberculous knee. Whether the limb has been put up in full extension or with some degree of flexion,

depends on the surgeon, and the social status of the patient. Often a knee ankylosed with a flexion of 30 to 40 degrees would be more suitable for a patient whose occupation is such as to demand a sitting position many hours a day than it would be for a patient whose occupation demands standing, as that of a clerk in a store, or a farmer, or a laborer. Theoretically, to secure fixation after such an operation, the cast should extend up to and embrace the pelvis, but practically this has been proved unnecessary. The cast may be made to run from the toes to the groin. A window should be cut over the knee sufficiently large to allow of dressing, and the removal of such drains as have been used. Ankylosis may not occur for a year after a resection for tuberculosis, but there will be ankylosis in from three to four months as a rule, after resections for inflammatory conditions. As soon as practicable, the cast should be taken off and a brace substituted, which in the case of tuberculosis of the knee can not usually be done earlier than from four to six months.

Arthrodesis of the Hip Joint.—After an operation to produce arthrodesis of the hip, a plaster of Paris cast spica must be worn, which extends from the chest to the toes. As the hip is usually put up at an angle of fixation of about 40 degrees, these patients are able to be on crutches, and to sit down with a moderate degree of comfort in a reclining chair. As the convalescence progresses it is usually permissible to shorten the cast so that it reaches to the knee only. This allows motion of the leg and foot, but it should not be done until ankylosis has progressed so far that the slight rotary movement allowed will in no way damage the new callous formation. The cast may only be discontinued when ankylosis is shown to be firm by both clinical and roentgenographic examinations.

Arthroplasty of the Hip Joint.—The object of such an operation is to produce a movable, stable joint. Motion must not be started too soon after the operation or the hip muscles will not unite properly at their insertion. Usually in five days gentle passive motion may be started, but should not be at all forced until sixteen or seventeen days. The postoperative fixation is important. After trying various methods of postoperative fixation, such as splints, and extensions, I have come to the conclusion that it is best to place the patient in a plaster of Paris spica hip cast which extends from well up on the chest to the toes on the affected side. This cast should be left on for about two weeks, when it may be split in half,

the stitches removed, and the posterior half of the cast used as a gutter splint. Both active and passive motion may then be instituted and usually at the end of three weeks the cast may be discarded altogether, and the patient allowed to be up. Every encouragement possible should be given him to get around on crutches and to move the hip. Active physiotherapeutic measures should be carried out. Active motion is of much more value than passive motion. Weight-bearing is permitted any time after four weeks. Much depends on the mental attitude of the patient and his willingness to force the joint and endure a little pain. While the patient



Fig. 429.—Adhesive strips to hold elbow in flexion.

is resting in bed an overhead Balkan frame with pulleys attached in such a manner that the patient may, by pulling on a rope, flex, abduct, and adduct the hip is of great benefit.

Arthroplasty of the Elbow.—Excision of the elbow is usually done not with the hope of establishing an ankylosis, but to give a movable joint and, for this reason, fixation is of very little importance, demanding a degree only sufficient to make the patient comfortable. This may best be obtained by the use of adhesive straps (Fig. 429). This simple procedure is just as effective as a plaster of Paris cast and allows of ready inspection of the wound.

The elbow should be kept fixed until blood clots have had time to organize, and no bleeding will follow motion. Moderate passive motion may usually be instituted in about five or six days. Care must be taken, however, not to cause the patient very much pain or he will involuntarily set all the muscles when an attempt is made to move his elbow. It is extremely important that the patient should be confident that the surgeon will not hurt him. Much greater movement will then be permitted. The elbow should be placed in acute flexion and gradually dropped down each time the forearm is lowered, care being taken that the arm can be forced back up into full flexion. If it is found that the patient is losing some of this flexion, the arm must again be placed in acute flexion and held there for a few days until the soreness subsides; the whole process must then be repeated. When it has been found necessary to remove a great quantity of bone from the joint surfaces, a joint more or less of the flail-joint type may develop. In these rare cases, a jointed brace may be used which extends two-thirds of the way down the forearm, and two-thirds of the way up the arm.

Purulent Arthritis.—The postoperative care in cases of purulent arthritis depends entirely on the severity of the infection, and the extent of the operation which has been necessary. The medical war literature of the day shows that if the infection is due to a foreign body the latter should be removed. Drainage should be only to the synovial membrane and no pocketing should be allowed. Adequate fixation to permit of drainage should be provided. Many physicians are enthusiastic over the Carrel-Dakin method, but emphasize the necessity of close attention to details. Massage of the muscles and both active and passive motion should be instituted as early as possible after the condition has become chronic, but the manipulation must not cause so much pain that the patient will unconsciously flinch when attempts at motion are made. The joint must be used to the point of tolerance.

Adequate drainage particularly in the knee joint is difficult to obtain and much may be done by changing the posture of the patient. The posterior compartment of the knee joint may not drain properly through an anterior incision and the necessity for making counter drainage may be avoided by turning the patient on his face. If the patient is debilitated, this posture may be so tiring that it can be maintained only for a few hours, but by turning the patient on his face every two or three hours the evacuation of the pus will be periodically secured.

Osteomyelitis.—If the treatment carried out is that of the ordinary method of draining, the dressing should be changed, and drains shortened and removed at the recognized time. The remaining sinuses should be irrigated daily with half of one per cent formalin and glycerin. The ordinary watery solutions should not be used for irrigation as they lead to unhealthy granulation-tissues and a sogginess of all the structures. The perfected technic of the Carrel-Dakin method has opened up a new field in the postoperative treatment of osteomyelitis. Its chief value is probably in the emphasis that is laid on the careful surgery that precedes the use of the solution. If the patient is to be treated by this method, the operation must be performed with that in view. Sequestra must all be removed, and the cavity remaining must be shaped so that the fluid, when introduced, will have ready access to all points. It is more frequently necessary, therefore, when this treatment is to be instituted, to take large amounts of the cortex in order to make the trough in the bone. For the actual technic of the method, the reader is referred to the original article by Carrel. Care must be taken that the directions are executed with exactness if this treatment is to be successfully carried out. The solution must be right and the facilities must be at hand to insure its use as frequently as is indicated. Certain cases respond well to the use of Beck's bismuth paste; it should be used only when there are no sequestra that may be keeping up the discharge. It is of chief value in sinuses that are sluggish.

Malignant Disease of Bones.—Malignant metastases of the bones are only too frequently seen following cancer of the breast, the thyroid, the prostate and hypernephroma of the kidney. Surgery, is, of course, useless for this condition. Sarcoma is frequently seen and radical surgery offers the patient the best chance. As a general rule, palliative conservative surgery in this class of cases may be considered useless. Radium in sarcoma of the bone has not been of much use particularly in the slow-growing cartilaginous type. Patients should have the benefit of Coley's serum. Coley has shown about equally good results in the worst and most hopeless type of cases from the use of the serum as is generally shown in the selected operative cases. The use of it is very often not productive of good results but the occasional brilliant result seen demands that patients should at least be told of it and its somewhat uncertain value. If it is not used the responsibility is then put on the patient.

Bow Legs and Knock Knees.—In the milder cases due to rickets many of the patients recover under proper medication, diet, and mechanical treatment. The usual operation in the severe cases is osteotomy. A cast should be worn until it is proved that bony ankylosis is complete. This should be controlled by roentgenograms and clinical examinations. Braces must be provided to prevent recurrence of the deformity; they should be worn for three months after the operation. If rickets is the underlying cause of the condition, the child should be placed on an antirachitic course of diet and medication.

Congenital Dislocation of the Hip.—Congenital dislocation of the hip is often double. Authorities give 75 per cent cures for the single, and 50 per cent for the double. Following the reduction, which is usually by the closed method, the cast must be worn for at least eight months. This period may be shortened in some of the older cases. The cast should be one which embraces the iliac crests and extends to the knee at least, and sometimes below, the leg being held in flexion, and abduction. Care must be taken that the condyles of the femur lie in the same plane as a line drawn through both acetabula. This insures that the head of the femur will not slip out posteriorly. For the first cast it is probably best that both legs shall be included and the frog position maintained even though the case is a unilateral one. When the knee is free it will be noted that the hamstrings are tight. The parents should be instructed gradually to force the extension to the limit. Each pull on the hamstrings tends thus to force the head of the femur further into the acetabulum. In the unilateral case after the first change of cast, the cast may include only the affected limb. At each change of cast the leg is dropped more nearly to the normal position until the leg in the final cast is only slightly abducted and flexed. The open operation is rather seldom performed, but the same procedures apply for the postoperative measures.

Coxa Vara.—Subtrochanteric osteotomy to overcome the adduction is the operation usually performed. A plaster of Paris cast which embraces the chest and pelvis and extends far enough down on the leg to insure maintenance of the position of abduction must be worn subsequently. Weight-bearing should not be permitted for at least three months after the operation. A high-soled shoe should be worn on the opposite foot, and crutches used. The rest accorded in this manner tends to protect the softened femoral head.

Club Foot.—Plaster of Paris should be applied immediately after the operation to hold the foot in an overcorrected position. In applying the cast it will be found easier to control the foot and to secure good positions, if the plaster of Paris is put on in two pieces after the stockinet and the flannel padding are carefully placed. The plaster may be applied by running from the ends of the toes back to about the insertion of the plantar fascia into the os calcis, thus making a little boot for the foot. The plaster of Paris bandage is then wound round the leg above the ankle, making a plaster of Paris stocking. These are allowed to set and it will then be found that the plaster of Paris boot will permit forcing the foot around well into overcorrection, while a plaster bandage may then be rapidly applied to bridge the gap between the two. It is essential, particularly in congenital club feet, to obtain the overcorrected position. The first cast is removed in three weeks, the stitches are then taken out and a new cast put on. At the end of from four to six weeks, the cast may usually be removed and braces applied. The type of shoe should be of a firm, solid last built up on the outer side of the sole to twice the thickness of the inner side. There should be an inside iron and an outside T-strap (Fig. 419). After the correction of the foot, if there is a marked inversion, it may be necessary to perform an osteotomy in the lower third of the tibia in order to correct the rotation. Massage and exercises should be carried out. In congenital cases, the parents must be impressed with the fact that the tendency is for recurrence, that a permanent cure, particularly in young children, can not be guaranteed, and that they should return from time to time for supervision and possibly for further operative work.

Hallux Valgus.—The dressing applied at the time of the operation should insure holding the great toe in a correct line. This may be done by placing a pad of gauze between the great and second toes (Fig. 430). Weight-bearing may be permitted as soon as the organization of the blood clot has taken place, which may be roughly stated to occur in about six or seven days. From this time on the patient should be encouraged to use the foot as much as possible. It is imperative that the patient be provided with shoes in which there is a straight inner side of the sole, for if he goes back to wearing the old type of shoe there will be a recurrence of the deformity.

Lame or Stiff Shoulder and Subdeltoid Bursitis.—Many patients present themselves with painful and stiff shoulders of doubtful etiology, which may or may not follow trauma. Relief may be given

by manipulation of the shoulder under ether. During such manipulations, adhesions can be felt, and even heard to break, as the arm is forced into the various positions of abduction, and internal and external rotation. Following this, the patient should be placed in bed with the arm tied to the head of the bed, and held there for at least twenty-four hours, when it may be gradually dropped down to the side. This should be followed by massage, and many times daily the patient should place his hand to the back of his head,

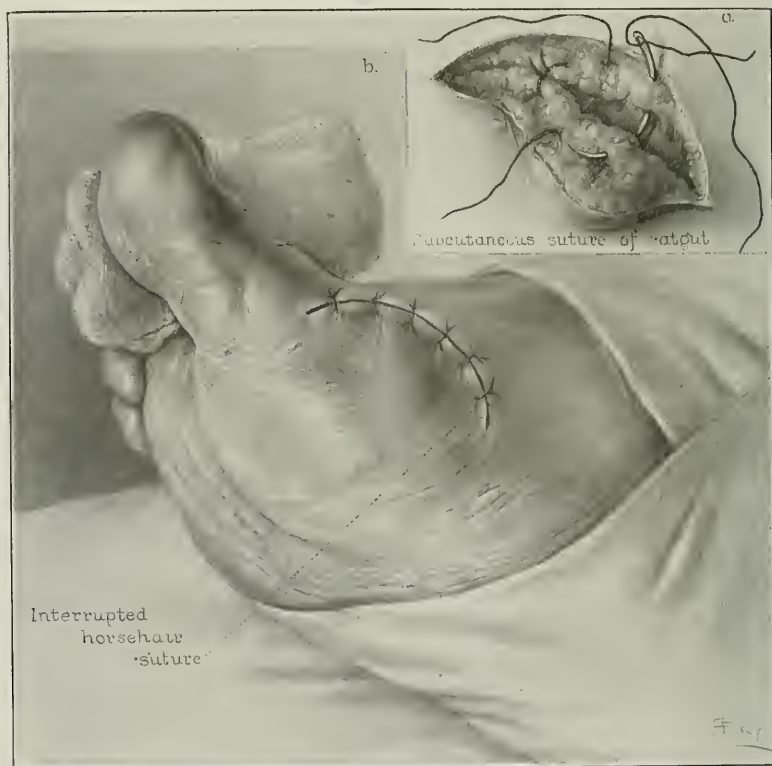


Fig. 430.—A. Subcutaneous tissues sutured with interrupted catgut sutures. B. Shows scar where shoe will not press upon it. A pad of gauze is placed between the first and second toes to maintain the correct position of the great toe.

and the forearm across the small of the back with the dorsal surface of the hand against the back. Operation may be performed for the removal of inflamed or calcified subdeltoid bursa; in either case the after-treatment should be active, that is, the patient should be encouraged to use the shoulder as soon as possible.

Recurrent Dislocation of the Shoulder.—If the operation described by Young is selected, which consists of a division of the pecto-

ralis major and the latissimus dorsi muscles at their insertion into the humerus, the arm should be put up at a right angle by the aid of a splint or plaster of Paris dressing. It should be held there for about ten days. The deltoid muscle should be massaged daily, the arm then gradually dropped down to the side, and full use permitted. If, however, the operation is that of reefing the capsule, the arm should be held to the side for from two to three weeks, then motion should be permitted gradually. Patients should be warned against abducting the arm to a right angle from the side before five or six weeks after the operation.



Fig. 431.—Abduction platform splint to be used after arthrodesis of shoulder.

Excision of the Shoulder Joint.—Tuberculosis of or an old dislocation of the head of the humerus may demand excision. While operating the arm should be placed at a right angle to the body and held there after the operation either by a plaster of Paris abduction splint, an aeroplane splint (Fig. 431), or merely a light Buck's extension hung over the edge of the bed. It will usually be sufficient to keep the arm in this position for about seventeen days when it may be gradually dropped down and moderate motion, both active and passive, begun, care being taken that power to resume the right angle position is retained.

Arthrodesis of the Shoulder.—Deltoid paralysis, due to anterior poliomyelitis, is a most unfortunate condition. It causes inability to abduct the arm. Good function can be given if the shoulder girdle-muscles, that is, the levator anguli scapulæ, the rhomboids, and the trapezius, are active, by producing an ankylosis of the head of the humerus to the glenoid fossa, with the humerus at a right angle to the scapula. A platform abduction arm splint is necessary to maintain the position after operation (Fig. 431), and the position must be maintained until it is seen by x-ray examination that ankylosis is complete. The results are most gratifying, the patient being able to place hand to head (Fig. 432).

Congenital Torticollis.—The principle to be followed in the post-operative treatment of congenital torticollis is that which is usually followed in any congenital deformity. That is, there must be over-correction immediately following the operation. A plaster of Paris cast should be applied embracing the thorax, neck, and head, care being taken, for example, in a right torticollis, that the left ear is held to the left shoulder, and the chin pointed to the right shoulder, the head being held in slight hyperextension. In certain mild cases in which the patient is old enough to cooperate and the involvement is slight, that is, the contraction due principally to the sternal portion of the sternal mastoid muscle, the condition may be treated without a cast, early active and passive movements being instituted. All patients should be treated by physiotherapeutic measures and suspension.

Tuberculosis of the Spine.—In recent years tuberculosis of the spine has come under the grouping of operative orthopedics. The operations advanced by Hibbs and Albee have attained deserved popularity. While differing in technic the principle of each is the same, that is, to secure a bony splint along the posterior surfaces of the vertebra. After the operation the patient must be placed so there will be no motion in the spine and at the same time make it possible to use the bed pan, etc. The gas pipe frame of Bradford with a fenestrated canvas is very convenient (Fig. 433). By raising the frame off the bed and placing it on blocks of wood the bed pan may easily be adjusted without moving the patient. Such patients are kept in bed for at least six weeks, and are then allowed up with a back-brace. In children the period of recumbency is lengthened even to six months in certain instances. Patients should be cautioned to use the back-brace for one year from the time the symptoms cease.

Psoas Abscesses.—Psoas abscesses are somewhat common complications of tuberculosis of the spine. The abscess should not be opened and drained. A tuberculous abscess not complicated by secondary infection may safely be let alone. If so large that it is inconvenient, it may be aspirated under the strictest asepsis and a few ounces of 10 per cent iodoform emulsion injected; this may be repeated. Occasionally in bad cases, secondary infection (hematog-



Fig. 432.—Showing ability to raise arm to head.

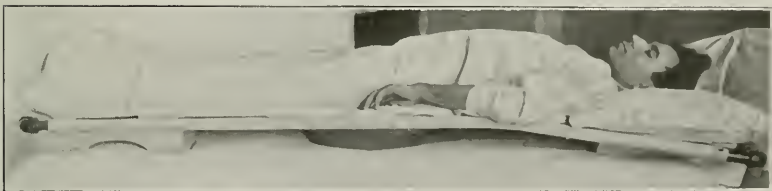


Fig. 433.—Bradford frame for patient with tuberculosis of spine showing bed pan in place.

enous) occurs and the skin over the abscess becomes red and inflamed. Many very good authorities even say it is then better not to incise them, but if possible to allow them to rupture of their own accord. If constitutional septic symptoms, hectic flush, afternoon fever, etc., are present, abscess should be drained at once.

Tendon Transference.—Following operations in which the tendon is transferred, or implanted in a new place, to obtain active function or merely to act as a suspensory ligament, postoperative fixation

must be of such length as to permit the union of the tendon in its new bed. It is probably safer to allow six weeks for this, than any shorter interval, and fixation is best provided by aid of plaster of Paris casts. The stitches may be left in for from three to four weeks. Many surgeons use chromic catgut for sewing up the skin, the advantage of this is that no attention need be paid to the removal of the stitches. I have found this suture somewhat unreliable, and still prefer using the silk worm and horse hair or some form of nonabsorbable suture. In tendon transference the question of muscle training arises. It must be remembered that the transferred tendon is operating in a new position. It is fascinating to watch a tendon which previously has been a flexor, gradually becoming an extensor under training. Moderate massage to further



Fig. 434.—Ankle brace with catch joint to prevent foot drop.

the nutrition of the new tendon is advisable, but best of all is its active and voluntary motion. In a tendon suspension operation, protection must be given to the new tendon for at least three months before permitting it to bear the full duties that may be imposed upon it. It must be remembered that the tendon which is used in this way had previously no function and now is called on to act as a suspensory ligament. If the operation in question has been on the ankle to prevent foot drop and the Tibialis anticus and the extensors have been fastened to the tibia, these new ligaments must be protected against undue strain by providing a right angle catch-brace for the ankle (Fig. 434).

Recurrent Dislocations of the Patella.—Whatever the type of operation done for recurrent dislocations of the patella, be it suturing and overlapping of the capsule, transplantation of the insertion of the quadriceps, or the bone-wedge method of Albee, a plaster of Paris cast should be applied extending from the groin to the ankle. It should be worn at least three weeks, when it may be cut in half, the posterior part worn as a gutter cast, for an additional two weeks, and gentle massage and passive motion instituted. Moderate active motion may be permitted at the end of another week.

Derangements of the Knee Joint.—The mechanical derangements of the knee joint are most frequently caused by a dislocated or fractured internal or external semilunar cartilage, or by loose bodies, usually having their origin in the internal condyle of the femur. The incision for the removal of the semilunar cartilage is made entirely through the soft parts and none of the important ligaments of the knee joint are injured. Many surgeons merely place a cotton dressing over the knee and provide no further fixation. The convalescence of the patient will, on the whole, be more satisfactory if a plaster of Paris cast is applied from the ankle to the groin to be worn about ten days. This cast is applied immediately the operation is completed. During this period crutches should be used, but on removal of the cast a cane may be substituted and at the end of three weeks after the operation full use permitted. An incision sometimes used for the removal of loose bodies is that of splitting the patella. After this, a plaster of Paris cast should be worn for three weeks. It will be found that no limitation of motion persists following the use of casts in this manner. As a matter of fact, full motion will return in many instances within a few days after the removal of the cast. The cast has the additional value in that it permits physiologic rest to the tissues which have been operated on, and the clean wound under the cast heals rapidly.

Flat Foot.—Flat foot as the term is commonly used, may be roughly divided into three groups:

1. The weak foot in which there is no visible deformity. Surgery in this type is not indicated.
2. The more or less spastic type in which on attempting to dorsiflex and invert the foot, resistance is encountered, due particularly to the spasm of the peroneal muscles. In this type, the deformity is beginning and the arch is visibly down. Surgery is of distinct benefit.

3. In the rigid nearly osseous type, the arch is down, the foot is fixed more or less and can not be dorsi-flexed or inverted to any appreciable extent. Surgery offers very little in such cases. The usual operation for the second group is the division of the peroneal tendons with manipulation to force the foot up into dorsal flexion and inversion, following which the foot is placed in a plaster of Paris cast, and held in this position for two weeks. On removal of the cast, massage and passive motion are instituted and the patient is encouraged to force the foot up into inversion and dorsal flexion. Shoes are provided with the inner side raised and an extension orthopedic heel applied so as to raise the inner side of the heel and carry it forward under the arch. Exercises are given, which encourage the patient to use the muscles pulling the foot up into inversion, particularly the *Tibialis anticus*, and the stretching of the peroneals.

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INDEX

A

- Abdominal binders, i, 475
 corsets, i, 479
 indication for, i, 478
 exercises, i, 500
 muscle, cultivation of, ii, 751
 operation, pain after, i, 36
 supporting bandage, ii, 751
 viscera, postoperative prolapse of, i, 170
 wall, ii, 748
 congenital weak areas, ii, 748
 musculature of, ii, 856
 tension sutures in, ii, 749
 weakness, feeling of, in ventral hernia, ii, 765
 wound, heliotherapy, ii, 751
- Abduction platform splint, ii, 1035
- Abortion, induction of, ii, 951
- Abscess, breast, ii, 713
 fascial space, ii, 1002
 ischiorectal, ii, 927
 liver, ii, 826
 pelvic, ii, 979
 subphrenic, i, 295
 tuboovarian, ii, 879
- Absorption in rectal feeding, i, 372
 through breast and axilla, i, 591
- Acapnia, i, 661
 doctrine of, i, 94
- Accidental intestinal fistula, ii, 822
- Acetone associated with diabetes, i, 232
 bodies, formation of, i, 233
 tests for, i, 236
 treatment of uterine cancer, ii, 896
- Acetonuria, i, 232
- Acidosis, i, 232
 causes of, i, 234
 resulting from starvation, i, 354
- Acid intoxication, i, 232
 symptoms of, i, 235
 treatment of, i, 237
- Acute dilatation of the heart, causes of, i, 113
 of the stomach, i, 118
 osteomyelitis, ii, 992
 pancreatitis, ii, 863
 septic peritonitis, ii, 782
- Adhesions between uterus and abdominal wall, ii, 964
 breaking up, i, 493
 following peritoneal operations, ii, 790
- Adhesive as abdominal support, i, 477
- Admission chart, i, 12
- Adrenalin as respiratory stimulant, i, 350
- Affections of the joints, ii, 990
- After-pains of obstetric operations, ii, 959
- After-treatment of diabetes, i, 214
- Agglutination and hemolysis, tests for blood, i, 599
 properties of blood for transfusion, i, 625-628
 grouping according to, i, 598
- Air, swallowing of, as cause of dilatation of the stomach, i, 121
- Alcoholism in its relation to surgery, i, 211
 systemic effects of, i, 211
- Alkalinity of Dakin solution, i, 418
- Amputation, ii, 981
 affections and complications, ii, 983
 aseptic, ii, 981
 bad scars complicating, ii, 985
 bandaging, ii, 981
 encouragement following, ii, 983
 hydrotherapy after, ii, 983
 immobilization following, ii, 981
 in gas bacillus infection, i, 272
 joint, contractures complicating, ii, 985
 massage following, ii, 981
 movements following, ii, 982
 of forearm providing a plastic club motor, i, 575
 of penis, ii, 903
 pain following, i, 38
 painful stumps following, ii, 984
 pressure exercise, ii, 981
 sinuses complicating, ii, 984
 through the arm, single motor flap in, i, 574
 through the forearm, double motor flap in, i, 574
 ulceration complicating, ii, 985
- Amyloid following pneumothorax, ii, 745
- Anal edema following hemorrhoid operation, ii, 918
 fistula, ii, 922
 lesions, ii, 914
 papilloma, ii, 925
- Anastomosis of gall bladder and intestines, ii, 846
- Anemia following splenectomy, ii, 870

- Anesthesia, anuria following, i, 247, 250
 areas, ii, 710
 chart, i, 8
 dreams during, i, 45
 effects of, on urine, i, 393
 in diabetics, i, 244
 general, acetonuria following, i, 232
 in operations for ileus, i, 136
 local, complications arising after, i, 46
 nephritis following, i, 247, 249
 paralysis, i, 55
 preventive measures, i, 58
 preliminary considerations and, i, 15
 time in operation to stop administration of, i, 22
 uremic coma following, i, 251
- Anesthetic, blood pressure as danger signal during administration of, i, 22
 choice of, i, 21
 delirium accompanying recovery from, i, 33
 fear of the, i, 18
 medication during recovery from, i, 34
 mortalities, i, 665
 preliminary preparation for the, i, 20
 sudden death under, i, 661
- Anesthetist, duties of, i, 19
 duty of, immediately after operation, i, 32
 woman physician, ideal, i, 19
- Ankle brace with catch joint to prevent foot drop, ii, 1038
- Anodynes in cystitis, i, 399
 on second postoperative day, i, 39
- Antisepsis, Carrel-Dakin method, ii, 997
 dichloramine dressings, ii, 998
 in infection of extremities, ii, 997
 Morison's method, ii, 998
 Wright's method, ii, 997
- Antiseptics, specific use of, i, 421
- Antitoxin in treatment of tetanus, i, 267
- Anuria following anesthesia, i, 247, 250
- Anus, artificial, resulting from two-stage colon resection, ii, 818
 fissure of, ii, 924
 pruritus of, ii, 926
 sacral, ii, 936, 937
- Apparatus for collecting blood serum, i, 340
 for proctocolysis, i, 578
- Appendicitis, ii, 851
 acute type, ii, 851
 chronic type, ii, 851
 diarrhea complicating, ii, 855
 drainage in, ii, 852
 early cases, ii, 851
 general care, ii, 853
- Appendicitis—Cont'd.
 in children, i, 644
 instruction to patient following operation for, ii, 859
 interval cases, ii, 851
 intestinal obstruction following, ii, 855
 McBurney's gridiron incision, ii, 857
 posture during drainage in, ii, 852
 purulent, ii, 853
 secondary pus collections, ii, 855
 suppurating cases, ii, 851
 wound dressings in, ii, 853
- Appendectomy, hernia following, ii, 762
- Appliances, vibration, i, 496
- Arm exercises, i, 502
 stump, apparent lengthening of, i, 572
 swelling in, following dissection of the axillary lymphatic structures, ii, 728
- Arteriosclerosis, pathologic cause of secondary hemorrhage, i, 105
- Artery, pulmonary, blocking of, by emboli, i, 310
- Arthritis, purulent, ii, 1030
- Arthrodesis of the hip joint, ii, 1028
 of the shoulder, ii, 1036
- Arthroplasty of the elbow, ii, 1029
 of the hip joint, ii, 1028
- Artificial feeding, cutaneous application, i, 382
 gastrostomy, i, 374
 intraperitoneal, i, 381
 intravenous, i, 378
 subcutaneous, i, 379
- nutrition, i, 369
 various methods of, i, 369
- respiration, i, 343
 Brosch's modification of Silvester's methods, i, 344
 Howard's method, i, 343
 lungmotor, i, 347
 manual method, i, 343
 Meltzer's pharyngeal insufflation apparatus, i, 347
 pulmotor, i, 347
 Schafer's prone pressure method, i, 346
 Silvester's method, i, 344
 Silvester-Howard method, i, 345
- Aseptic amputation, ii, 981
 wounds, early treatment of, i, 406
- Aspiration pneumonia following laryngectomy, ii, 711
 following thyroidectomy, ii, 705
- Athletic web corset, i, 480
- Attitudes of postures, role of, in backache, i, 86
- Autotransplantation of bone, i, 438
- Axilla, bandaging the, i, 450
- Axillary space, drain in, ii, 725

B

- Bacillus aerogenes capsulatus*, i, 269
 Back brace, ii, 1017
 Backache, i, 82
 coccygodynia associated with, i, 88
 floating kidney as cause of, i, 85
 in ventral hernia, ii, 765
 menstruation as cause of, i, 83
 treatment of, i, 88
 Bacteriemia, i, 255
 as cause of thrombosis, i, 303
 defined, i, 255
 prognosis in, i, 258
 symptoms of, i, 258
 treatment of, i, 259
 Balsam of Peru in treatment of
 wounds, i, 414
 Bandage scissors, i, 442
 Bandages, chest, i, 449
 towel, i, 452
 classification of, i, 440
 face, i, 447
 foot, i, 460
 hand, i, 457
 head, i, 443
 hood, i, 448
 leg, i, 460
 lower extremities, i, 459
 method of cutting, i, 441
 neck, i, 448
 cardboard inserts to hold up, i, 450
 plaster of Paris, i, 462
 removal of, i, 442
 rolling by hand, i, 442
 shoulder, i, 450
 suspensory, i, 461
 T, i, 461
 thigh, i, 459
 upper extremity, i, 456
 Velpeau, i, 455
 Bandaging, i, 440
 after amputation, ii, 981
 too tight, pain caused by, i, 38
 Bartholin glands, vaginal discharge
 from, ii, 892
 Bath, electric cabinet, i, 532
 Nauheim, i, 528
 sitz, i, 526
 shallow, i, 531
 sheet, i, 530
 Beck's bismuth paste in wound treat-
 ment, i, 421
 paste in treatment of sinuses, i, 201
 Bed, headrest built in, i, 5
 ideal for postoperative patient, i, 3.
 4
 preparation of, to receive patient, i,
 31, 32
 removal of patient from table to, i,
 23
 Bedsores, i, 164
 electric light treatment of, i, 168
 in old age, i, 652
 involving the deeper tissues, i, 168
 following myelitis, i, 165
 pathology of, i, 166
 treatment of, i, 167
 Benign breast tumors, ii, 718
 Bilateral infection in parotitis, i, 290
 Bile, diversion of, when gall bladder
 is anastomosed with intestine,
 ii, 845
 duct, operations on the, ii, 843
 reconstruction of, ii, 847
 stricture of, ii, 847
 in exudate from liver abscess, ii, 827
 Biliary fistula, ii, 835
 Binder, abdominal, i, 475
 in obstetrics, ii, 958
 Biological defensive mechanism of
 body, i, 256
 Bismuth paste, Beck's, injection of, i,
 422
 in treatment of sinuses, i, 201
 Bladder, effects of anesthesia on, i, 393
 fistulae of the, i, 196
 injuries to the, ii, 909
 injury to the, from pelvic operations,
 ii, 893
 Blebs, formation of, after thyroidec-
 tomy, ii, 701
 Blood, accumulation of, in stomach,
 postoperative, ii, 792
 amount of, in human body, i, 105
 changes following splenectomy, ii,
 869, 870
 manifested in burns, i, 155
 clotting time of, determining, i, 336
 effect of massage on, i, 487
 in exudate from liver abscess, ii, 827
 increasing in heart and central nerv-
 ous system, i, 111
 pressure, as danger signal during
 administration of anesthetic,
 i, 22
 fall of, i, 107
 rise following repair of hernia, ii,
 769
 specimen in bacteriemia, technic of
 taking, i, 257
 stream, slowing of, as cause of throm-
 bosis, i, 303
 transfusion, i, 596
 after hemorrhage, i, 112
 blood being driven into recipient's
 veins, i, 621
 blood entering recipient's veins, i,
 616
 cannula for recipient's vein, i,
 615
 citrate method, i, 610

- Blood transfusion—Cont'd.
 cylinder coated with paraffin, i, 619
 danger signal from donor's side, i, 623
 danger signals from recipient's side, i, 623
 dissecting out the vein, i, 603
 first performance, i, 596
 history of, i, 596
 in acute hemorrhage, i, 603
 indications for, i, 603
 indirect methods, i, 605
 instruments and material used in, i, 602
 in treatment of shock, i, 99
 Kaliski needle, i, 611
 Percy transfusion tube, i, 622
 quantity of sodium citrate used, i, 615
 recipient's wound sutured, i, 618
 reinjection of blood, i, 623
 selection of donors, i, 598, 624-628
 syringe method, i, 605
 technic of, i, 604
 technic of grouping blood for, i, 599
 toxic symptoms following, i, 601
 transfusing method of introducing needle, i, 612
- Body fluids, power of, to kill bacteria, i, 257
- Bone atrophy taking place in vicinity of foreign body, i, 175
 autotransplantation, i, 438
 flap sutured in amputation, i, 569
 grafting, ii, 993
 indications for, ii, 994
 principles underlying operation, ii, 994
 pin for producing traction, ii, 987
 surgery, ii, 986
 syphilis of, ii, 991
 transplantation of, i, 435
 tuberculosis of, ii, 991
- Bones and joints, pain after operation on, i, 37
 malignant disease of, ii, 1031
- Bow legs and knock knees, ii, 1032
- Bowel, attaching to fascia and peritoneum before opening, ii, 814
 circulatory disturbances in, ii, 813
 disturbances as cause of sleeplessness, i, 64
 injury during removal of pus tubes, ii, 882
 movement following rectal excision, ii, 923
 need of, in various cases, i, 384
 prophylactic measures, i, 386
- Bowels, care of, after operation other than gastrointestinal, i, 383
- Bowels, care of—Cont'd.
 following obstetric and vaginal operations, ii, 944
 following rectovesical fistula operation, ii, 940
- Brace for Pott's fracture, ii, 1023
 stiff-legged, ii, 1018
- Braces for club feet, ii, 1018
- Brachial plexus paralysis, i, 56
- Bradford frame for patient with tuberculosis of the spine, ii, 1037
 use of, to prevent bedsores, i, 167
- Brain abscess, operations for, ii, 685
 fat embolism of the, i, 142
- Breast abscess, ii, 713
 incision technic, ii, 714
 carcinoma of, treatment with roentgen rays, i, 536
 care of, ii, 954
 dressing, ii, 729
 feeding following operations in infants, i, 638
 massage of, ii, 953
 operations, hemorrhage following, ii, 720
 scar following operation on, ii, 724
 stimulating massage, ii, 956
 tumors, benign, ii, 718
- Breathing exercises, i, 503
 tube to be used following harelip, ii, 680
- Brewer's empyema drainage tube, ii, 739
- Broken position in inguinal hernia, ii, 753
- Bronchial fistulæ, i, 194
- Bronchitis, postoperative, i, 282
 treatment of, i, 283
- Brosch's modification of Silvester's method of artificial respiration, i, 344
- Burns, i, 150
 blood changes manifested in, i, 155
 depilatory, i, 150
 ether, i, 151
 from electric lights, i, 152
 from enemas, i, 152
 from hot water bottles, i, 151
 in children, i, 646
 iodine, i, 150
 morbid anatomy of, i, 154
 pathology of, i, 154
 prognosis of, i, 159
 shock accompanying, i, 157
 systemic symptoms of, i, 156
 treatment of, i, 159
 x-ray i, 153
- Bursting of abdomen, sensation of patient, i, 172

C

- Cesarean section, ii, 963
 artificial respiration in, ii, 967
 diuresis in, ii, 967
 for placenta previa, ii, 964
 pregnancies following, ii, 968
 skin care following, ii, 967
 vaginal, ii, 969
- Caffeine, effect of, in surgical patients, i, 209
- Calculus, pelvic or ureteral as cause of backache, i, 86
- Calorie requirement in postoperative feeding, i, 355
- Cancer of the mouth and throat, radium in treatment, i, 559
 of the stomach, ii, 805
 postoperative care, ii, 807
 wound healing, ii, 806
 of the pancreas, ii, 866
 of the throat and mouth, radium in treatment of, i, 559
 of the uterus, ii, 895
- Canvas stretcher for carrying patient from operating table to bed, i, 24
- Carbuncles on the neck, ii, 689
- Carbohydrate preferable in postoperative feeding, i, 356
- Carbohydrates, forcing of, before operation, i, 355
- Carbon dioxide, theory of sleep, i, 65
- Carcinoma of the breast, lymphatics in relation to, i, 541
 roentgen ray treatment of, i, 536
 of the rectum, radium in treatment, i, 550
 of the uterus, radium in treatment, i, 545
- Cardboard inserts to hold up neck bandage, i, 450
- Cardiac failure in shock, i, 94
 stimulants, i, 116
- Cardiovascular system, changes in, in old age, i, 648
- Carrel-Dakin glass distributor, i, 419
 method of antiseptics, ii, 997
- Catgut as source of tetanus infection, i, 263
- Cathartics, i, 386
 and foods after intestinal operation, ii, 810
- Catheter, indwelling, ii, 904
 to be used as hepatic duct drain, ii, 843
- Catheterization following obstetric operations, ii, 948
 following rectovesical fistula, ii, 939
 in the female, technic, ii, 949
 of the female, i, 395
 of the male, i, 394
- Cartilage, transplantation of, i, 435
- Cautery division of cervix in supra-vaginal hysterectomy, ii, 895
- Cellulitis in diabetes, i, 242
- Cerebral fat embolism, i, 143
- Cervical polyp, ii, 895
- Chapple's method of reamputation, i, 569, 570
- Chart, admission, i, 12
 anesthesia, i, 8
 clinical analysis, i, 13
 postoperative orders, i, 9
 treatment, i, 12
- Charts and records in postoperative cases, i, 7
- Chest, wounds of the, ii, 676
- Chemical changes influencing formation of thrombi, i, 302
- Chest bandages, i, 449
 towel, i, 452
 complications in urinary surgery, ii, 901
- Children, appendicitis in, i, 644
 burns in, i, 646
 empyema in, i, 640
 furunculosis, i, 640
 intubation, i, 639
 postoperative treatment in, i, 638
 pyloric stenosis in, i, 642
 removal of tuberculous glands, i, 639
 stricture of the esophagus, i, 642
- Chin, wounds of the, ii, 676
- Chloroform, mortality under, i, 666
- Cholecystitis, cure of, by removal of stones and drainage, ii, 832
- Chronic osteomyelitis, ii, 993
 pancreatitis, ii, 864
 peritonitis, ii, 789
 pneumothorax, ii, 745
- Chylous fistula, ii, 710
- Circulation, stimulation of the, i, 349
- Circulatory disturbances in the bowel, ii, 813
 failure during or after anesthesia, i, 30
 system in shock, i, 100
- Circumcision, ii, 902
- Citrate transfusion, i, 610
- Clamps left on stump of gall bladder, ii, 840, 842
- Clamps on blood vessels, following rectal excision, ii, 935
- Cleft palate, postoperative treatment of, ii, 681
- Clinical analysis chart, i, 13
- Closed wounds, early treatment of, i, 406
- Clotting time of the blood, determining, i, 336
- Club feet, braces for, ii, 1018
- Club foot, ii, 1033

- Coagulation in relation to thrombosis,
 i, 301
 of normal blood, i, 334
- Cocaine habit, treatment of, i, 208
- Coccygodynia associated with backache,
 i, 88
- Coffee habit in surgical patients, i, 209
- Cold douche, i, 531
- mitten friction, i, 530
- prolonged, reflex of, i, 520
- short, reflex effect of, i, 520
- sitz bath, i, 526
- wet pack, i, 525
- Collodion in wound dressing, ii, 824
- Colon, preoperative preparation of, i,
 354
- resection, ii, 811
- Compensation for hemorrhage, i, 106
- Complications in fecal fistulæ, i, 191
- in operations about the face, ii, 677
- Compound fractures, ii, 986
- Concealed hemorrhage, i, 108
- Congenital dislocation of the hip, ii,
 1032
- torticollis, ii, 1036
- Conjunctivitis, ether, i, 49
- Constipation in the aged, i, 652
- instructions given patients suffering
 with, i, 390
- Continuous hypodermoclysis, i, 592
- Convulsions in tetanus, i, 265
- Cornual exudate, i, 881
- Corset, athletic web, i, 480
- for use after operation, i, 479
- Cotton pledgets, technic for making, i,
 413
- Coughing as cause of prolapse of ab-
 dominal viscera, i, 171
- Coxa vara, ii, 1032
- Cradle, wire, for exposing large sur-
 face, i, 423
- Cranium, after-treatment of operations
 on, ii, 681
- decompression operations, ii, 683
- hematoma of, ii, 683
- hemorrhage about the, ii, 686
- operations for removal of sequestra
 ii, 685
- operations for repair of defects, ii,
 684
- operations, through an infected field,
 ii, 684
- osteoplastic flaps, ii, 684
- plastic flaps from the scalp, ii, 683
- postoperative complications, ii, 685
- sebaceous cysts of, ii, 683
- shock following operations on the, ii,
 686
- surgically clean wounds, ii, 682
- Cupping device, an automatic glass rub-
 ber, i, 424
- in pneumonia, i, 279
- Cupping—Cont'd.
 massage, i, 494
- Cutaneous application of cod liver oil
 as food i, 382
- eruptions, i, 325
- Cyst of the pancreas, ii, 866
- Cystic duct, infection of region sur-
 rounding, after removal of gall
 bladder, ii, 842
- Cystitis, i, 393
- differential diagnosis, i, 397
- following obstetric operations, ii, 947
- local treatment, i, 400
- prophylactic treatment of, i, 398
- symptoms of, i, 397
- treatment of, i, 396, 398
- Cystotomy, ii, 910

D

- Dakin's fluid in treatment of bacte-
 remia, i, 259
- in wound treatment, i, 415
- Dangers immediately postoperative, i,
 27
- Death, facies show, i, 658
- signs and symptoms of impending, i,
 656
- sudden, i, 659
- Decompression operations, ii, 683
- Decubitus, i, 164 (*see* Bedsores)
- of the tracheal wall, ii, 693
- Delirium, febrile, i, 225
- hysterical, i, 227
- nervosum, i, 226
- recovery from anesthetic accompa-
 nied by, i, 33
- senile, i, 227
- tremens, i, 212
- mortality in, i, 215
- preventive treatment of, i, 214
- symptoms of, i, 213
- Depilatory burns, i, 150
- Depression, mental, readjustment of,
 postoperative, i, 635
- Diabetes, anesthesia in, i, 244
- causes of, i, 239, 240
- cellulitis in, i, 242
- complications of, i, 240
- in surgery, i, 239
- mortality of surgical cases compli-
 cated by, i, 243
- neuritis in, i, 244
- otitis media in, i, 242
- septic processes in, i, 242
- treatment of, before operations, i, 243
- Diabetic collapse, i, 245
- coma, i, 245
- gangrene, i, 241; ii, 986
- Diagnosis of dilatation of the heart, i,
 116
- Diamond effleurage, i, 488

Diarrhea as complication of appendicitis, ii, 855
 fermentive, i, 389
 nervous, i, 389
 postoperative, i, 389
 septic, i, 390
 stercoral, i, 390
 Dichloramine dressings, ii, 998
 Dietary in reconstruction of patient, i, 632
 Diet, Finney's, for gastrostomy, i, 377
 following operation for stomach ulcer, ii, 801, 802
 following vaginal operations, ii, 943
 in cancer of the stomach, ii, 805
 in dilatation of the heart, i, 117
 in gynecologic plastic operations, ii, 976
 in old age, i, 653
 in orthopedic surgery, ii, 1012
 in peritonitis, ii, 787
 in reduction of obesity, i, 363
 in skin eruptions, i, 327
 postoperative, i, 359
 aim in, i, 355
 carbohydrate in, i, 356
 fluid in, i, 356
 nature of operation in consideration of, i, 353
 progression in, i, 358
 protein in, i, 356
 Dietetics, postoperative, i, 352
 Diets for gastrostomy, i, 377
 Digestion in the intestine, i, 370
 Digestive organs, effect of massage on, i, 486
 tract, fistulæ of, i, 188
 Dilatation of the heart, i, 113
 of the stomach, i, 118
 cause of, i, 120
 diet during, i, 360
 prognosis of, i, 122
 symptoms, i, 119, 123
 time of, i, 119
 treatment of, i, 124
 Dislocations and sprains, exercise in, i, 511
 of the patella, ii, 1039
 Diuresis in Cesarean section, ii, 967
 Dizziness accompanying headache, i, 76
 Donors, selection of, for transfusion, i, 624-628
 Door, antislamming device for, i, 3
 Double motor flap in amputation through the forearm, i, 574
 Douche, cold, i, 531
 Drain tube, gall bladder, ii, 833
 Drainage fistula, opening fasciæ and peritoneum in making, ii, 814
 intestinal ii, 822
 for breast abscess, ii, 715

Drainage—Cont'd.
 in appendicitis, ii, 852
 in cyst of the pancreas, ii, 867
 in empyema, ii, 733
 in fallopian tube operations, ii, 884
 in infection of extremities, ii, 996
 in liver abscess, ii, 827
 material in peritonitis, ii, 783
 of thoracic tumors, ii, 725
 of wounds, i, 428
 tube, intestinal, ii, 815
 wounds, binders required with, i, 479
 Draining the jugular veins by massage, i, 489
 Dreams during anesthesia, i, 45
 Dressing wounds, i, 406
 Drug addiction in surgical patients, i, 204
 treatment of, i, 206
 eruptions, treatment of, i, 330
 treatment for sleeplessness, i, 67
 Drugs causing skin eruption, i, 328
 used to control delirium tremens, i, 215
 Dry cupping in pneumonia, i, 279
 mouth after anesthesia, i, 50
 Duodenal fistula following gall bladder removal, ii, 841
 Dynamic ileus, i, 128
 following ruptured tubal pregnancy, ii, 887

E

 Edema, anal, following hemorrhoid operation, ii, 918
 pulmonary, i, 283
 Effleurage, diamond, i, 488
 technic of, i, 487
 Elbow, arthroplasty of the, ii, 1029
 Elbrecht's device for proctoclysis, i, 578
 Electric cabinet bath, i, 532
 coagulation following radium treatment, i, 560
 heater, ii, 965, 967
 light burns, i, 152
 treatment of bedsores, i, 168
 Electricity as respiratory stimulant, i, 350
 Elimination, effect of massage, i, 486
 Eliminative measures essential in post-operative psychoses, i, 223
 Embolism and thrombosis following gynecologic operations, ii, 945
 fat, i, 139 (*see* Fat embolism)
 pulmonary, i, 309 (*see* Pulmonary embolism)
 Embolus, pathogenesis of, i, 311
 Empyema, i, 285; ii, 732
 Brewer's drainage tube, ii, 739
 drainage apparatus in place, ii, 743
 drainage in, ii, 733

Empyema—Cont'd.

- general treatment, ii, 744
- in children, i, 640
- pressure within the chest in, ii, 740
- respiration in, ii, 742
- subdiaphragmatic, i, 295

Encouragement following amputation.

ii, 983

Enema, burns from, i, 152

- in treatment of hemorrhoids, ii, 916
- magnesium sulphate, i, 387
- mineral oil as, i, 388
- nutrient, i, 370
- preferable to cathartics postoperative, i, 387

Encapsulated peritonitis, ii, 789

Enterovesical fistulæ, i, 197

Epileptics, headaches in, i, 76

Episiotomy wounds and perineal lacerations, ii, 961

Epispadias and hypospadias, ii, 903

Epithelioma, excision of, i, 555

- of the face, i, 556
- of the genitals, i, 558
- of the hand, i, 558
- of the lip, i, 557
- of the nose, i, 557
- radium in treatment of, i, 552

Erysipelas, i, 331

- symptoms of, i, 331
- treatment of, i, 332

Esophageal fistulæ, i, 188

- sound, passing of, as remedy for hicough, i, 73

Ether and chloroform, mortality rates under, i, 666

- as cause of pneumonia, i, 275
- burns, i, 151
- conjunctivitis, i, 49
- elimination of, i, 33
- headaches, i, 75
- mortality under, i, 666
- narcosis to stop hicough, i, 73
- rash, i, 326

- renal function interfered with during administration, i, 248

- swallowing of, as cause of dilatation of the stomach, i, 121

Ethyl chloride, mortality under, i, 667

Etiology of dilatation of the stomach.

i, 120

- of incisional ventral hernia, ii, 761
- Excision of epithelioma, i, 555
- of the rectum, ii, 931 (*see* Rectal excision)

- of the shoulder joint, ii, 1035

Exclusion of the pylorus, ii, 799

Exercise, i, 497

- and massage, i, 483
- for relaxed abdominal muscles, i, 500
- functional treatment of fractures, i, 513

Exercise—Cont'd.

- in reconstruction of the patient, i, 633
- in reduction of obesity, i, 366
- in treatment of joint disturbances, i, 511
- in treatment of sprains and dislocations, i, 511
- general outline of, i, 500
- movements of skill, i, 497
- physiologic effect of, i, 499
- of effort, i, 498
- to improve posture, i, 501

Exercises, abdominal, i, 503

- arm, chest, and back, i, 502

- for flat feet, i, 508

- for hernia, i, 506

- for strengthening the heart, i, 504

- in paralysis, i, 515

- leg, i, 503

- trunk, i, 503

Exhaustion hypothesis of shock, i, 95

Exploration of hematoma, ii, 683

Exposure of body in preparation as cause of postoperative pneumonia, i, 276

External sphincter ani, complete tear of, ii, 941

Extirpation of the pancreas, ii, 861

Extrathoracic massage of the heart, i, 350

Extremities, infectious of, ii, 995

- surgery of, ii, 981

Eye, irritated during anesthesia, washing in, i, 33

Eyeballs, turning upward, as aid in bringing on sleep, i, 66

Eyes, protection of, during anesthesia, i, 21

F

Face and cranium, postoperative treatment, ii, 675

- bandages, i, 447

- epithelioma of, i, 556

- postoperative treatment of, ii, 675

Facial paralysis from pressure of anesthetist's fingers, i, 57

Fascia, infectious of, ii, 1002

- lata flap, excising in repair of hernia, ii, 775

Fascial space abscess, ii, 1002

- transplantation for hernia repair, ii, 773

Fat embolism, i, 139

- cerebral type, i, 143

- history of, i, 139

- of the brain, i, 142

- of lung following multiple fracture, i, 140

- treatment of, i, 143

- Fat embolism—Cont'd.
 venesection in treatment of, i, 144
 metabolism, formation of acetone
 bodies due to, i, 233
- Fallopian tubes, ii, 881
 bowel injury during removal of, ii
 882
 drainage of, ii, 884
 infected, effect of, on heart, ii, 883
 ligation of, for prevention of preg-
 nancy, ii, 881
 tuberculous, ii, 887
 plastic surgery of, ii, 884
- Fear as cause of postoperative insan-
 ity, i, 249
 as factor in operative results, i, 18
 mental readjustment of, postopera-
 tive, i, 635
 of the anesthetic, i, 18
- Febrile delirium, i, 225
 differentiation from insanity, i, 225
- Fecal contamination as source of tet-
 anus infection, i, 264
 fistula, ii, 757, 854
 fistulae, location of, i, 190
 prognosis of, i, 191
 treatment of, i, 192
- Feeding following rectal excision, ii,
 938
 insane patients, i, 224
 intestinal, ii, 815
 postoperative, i, 352
- Female, pelvic organs, ii, 873
- Femur, fracture of neck of, ii, 1024
 fracture of shaft of, ii, 1023
- Fenestrum in a plaster cast, i, 431, 471
- Fermentive diarrhea, i, 389
- Fibromyoma of the uterus, ii, 894
- Finney's diet in gastrostomy, i, 377
- Fissure of anus, ii, 924
- Fistula, biliary, ii, 835
 duodenal, following gall bladder re-
 moval, ii, 841
 fecal, ii, 854
 in ano, ii, 922
 mucous, following gall bladder
 drainage, ii, 837
 of the bladder, i, 196
 rectovaginal, ii, 940
 rectovesical, ii, 939
 vesicovaginal, ii, 978
- Fistulae, i, 187
 bronchial, i, 194
 definition of, i, 187
 enterovesical, i, 197
 esophageal, i, 188
 gall bladder, i, 195
 intestinal, i, 189
 of the digestive tract, i, 188
 of the thoracic duct, i, 194
 of the urinary tract, i, 196
 parotid, i, 194
- Fistulae—Cont'd.
 stomach, i, 188
 treatment, i, 187
 umbilical, i, 195
 vesicovaginal, ii, 970
- Fistulous tracts involving rectum and
 anus, ii, 922
- Fixation in orthopedic surgery, ii, 1013
- Flaccid paralysis, i, 516
- Flapless method of reamputation, i, 571
- Flat feet, exercise for, i, 508
- Flat foot, ii, 1039
 as cause of headache, i, 87
 postoperative, i, 87
- Floating kidney as cause of headache,
 i, 85
- Fluid in postoperative diet, i, 356
- Fluids administered before operation
 as prevention of postoperative
 thirst, i, 39, 40
- Fomentation, i, 523
- Food, as etiologic factor in producing
 skin disease, i, 327
 lack of, as cause of sleeplessness, i, 62
- Foods and cathartics after intestinal
 operation, ii, 810
- Foot bandages, i, 460
- Forceps deliveries, ii, 952
- Forceps lost in peritoneal cavity, i, 176
- Forcing mouth open for forced feeding,
 i, 223, 224
- Forearm, amputation of, providing a
 plastic club motor, i, 575
 fracture of the, ii, 1027
- Forehead, wounds of the, ii, 675
- Foreign bodies as cause of sinuses, i,
 199
 lost in peritoneal cavity, i, 175
 case cited, i, 176
 final disposition of, i, 181
 prevention of, i, 182
 prognosis in, i, 182
 symptoms of, i, 181
- Foreign substances, as factor in delay-
 ing wound healing, i, 431
- Formula for nutrient enema, i, 372, 373
- Fracture cases causing glycosuria, i,
 240
 of the forearm, ii, 1027
 of the humerus, ii, 1025
 of the femur, ii, 1024
 of the shaft of the femur, ii, 1023
 of the tibia, cast for, ii, 1021
 Pott's, ii, 1022
- Fractures, fat embolism following, i, 140
 functional treatment of, i, 513
 in diabetes, i, 241
 of the clavicle in children, i, 645
 orthopedic surgery, ii, 1020
 primary closure, ii, 986
 suppurating cases, ii, 989
 ununited, ii, 990

- Friction, i, 494
 Frostbite, i, 158
 Functional headaches, i, 75
 due to vasomotor disturbances, i, 76
 inhibition due to narcotic drugs, i, 206
 Furuncles on the neck, ii, 688
 Furunculosis in children, i, 640
- G
- Gall bladder and duets, ii, 832
 anastomosed with intestine, diversion of bile, ii, 845
 and intestine, anastomosis of, ii, 846
 circular suture tied in, ii, 834
 clamps left on stump of, after removal, ii, 840
 drainage tube, ii, 832, 833
 fistulæ, i, 195
 hemorrhage in connection with operations on the, ii, 848
 operation, instructions given patients following, ii, 849
 removal, after-treatment, ii, 839
 secondary removal of, ii, 838
 self-inverting suture introduced into, ii, 833
 shelled out of Glisson's capsule, ii, 837
 Gallstone colic as cause of backache, i, 85
 Gallstones, recurrence of symptoms after operation for, ii, 848
 Gangrene, diabetic, i, 241; ii, 986
 following amputation, ii, 986
 foudroyante, i, 269
 in relation to diabetes, i, 240
 senile, ii, 986
 Gas bacillus infection, i, 269
 frequency of, i, 269
 symptoms of, i, 270
 treatment of, i, 271
 infection with, ii, 1001
 gangrene, i, 270
 Gastric fistulæ, prognosis, i, 189
 lavage for relief of vomiting and nausea, i, 43
 postoperative, i, 357
 special tube for continuous, i, 45
 technic of, i, 43
 or intestinal indigestion as cause of headache, i, 75
 Gastroenterostomy made too far from the pylorus, ii, 799
 opening too large, ii, 800
 vomiting following, ii, 795
 Gastrointestinal tract, preoperative preparation of, i, 354, 355
- Gastrostomy, as means of artificial feeding, i, 374
 diets for, i, 377
 Gauze packing in the peritoneal cavity, ii, 885
 pad lost in peritoneal cavity, i, 178
 Gellhorn apparatus for applying heliotherapy to an undressed abdominal wound, ii, 751
 Germicidal gas in treatment of sinuses, i, 202
 Glisson's capsule, gall bladder shelled out of, ii, 837
 sutured, ii, 840
 Glucose in proctoelysis, i, 584
 Glycerine and water, gauze moistened with, to prevent open mouth from drying, i, 291
 pack for inflamed scrotum and penis, i, 412
 Glycosuria caused by surgical lesion, i, 239
 causes of, i, 239, 240
 Goiter, ii, 694
 operation patient in bed on face immediately after, ii, 696
 recurrence, ii, 708
 steam inhalation after operation, ii, 697
 Goiters, dressing for, i, 449
 Gout as cause of backache, i, 85
 Graft, spreading on gutta percha, i, 434
 Grafts, cutting, i, 433
 injecting anesthetic previous to cutting, i, 432
 Granulations covered with gutta percha, i, 427
 treatment of, i, 430
 Granulomata of the trachea, ii, 693
 Gutta percha, spreading grafts on, i, 434
 Glycosuria in surgical convalescence, i, 239
 Gynecologic disorders, backaches caused by, i, 89
 operations, general considerations, ii, 942
 thrombosis and embolism following, ii, 945
 plastic operations, ii, 975
- H
- Hacking, i, 495
 Hagner bag, ii, 906
 Hallux valgus, ii, 1033
 Hand bandages, i, 457
 Harelip, postoperative treatment, i, 638
 Harelips, postoperative treatment, ii, 680

- Head bandages, i, 443
 roller bandage, i, 443
 towel bandage for, i, 444
- Headache, i, 74
 ether, i, 75
 functional, i, 75
 hysterical, i, 76
 infection or inflammation as cause of, i, 76
 menstruation as cause of, i, 78
 ocular, i, 74
 treatment of, i, 79
- Headrest built in bed, i, 5
- Healing of wounds, historical considerations, i, 401
 principles underlying, i, 401
- Heart, dilatation of, i, 113
 diagnosis, i, 116
 pathology of, i, 115
 treatment of, i, 116
 effect of pulmonary pressure on, i, 115
 exercises for strengthening, i, 504
 in patient with infected fallopian tubes, ii, 883
 massage, i, 350
 muscle, i, 113
- Heat prostration, i, 149
 stroke, i, 147
 prevention of, i, 148
 treatment of, i, 148
- Heating compresses, i, 524
- Hebosteotomy, ii, 969
- Heel an example of weight bearing stump, i, 566
- Hematoma about the cranium, exploration of, ii, 683
- Hemierania, i, 77
- Hemolysis and agglutination tests for blood, i, 599
- Hemolysis of blood, grouping for transfusion, i, 598
- Hemophilia, i, 333
 hereditary, i, 333
 operations to be avoided in cases of, i, 336
 prognosis of, i, 336
 treatment of, i, 336
- Hemorrhage, i, 103
 after gynecologic operation, ii, 979
 after tracheotomy, ii, 693
 application of thromboplastin solution to stop, i, 109
 concealed, i, 108
 delayed, i, 104
 diagnosis of, i, 108
 following hemorrhoid operation, ii, 919
 following plastic operation on the breast, ii, 720
 following removal of tonsils and adenoids, i, 640
- Hemorrhage—Cont'd.
 from cranial operation, ii, 686
 in connection with operations on the biliary passages, ii, 848
 in the joints, i, 334
 in operations about the face, ii, 677
 postpartum and postoperative, ii, 971
 prevention of, i, 110
 primary, i, 103
 reactionary, i, 104
 secondary, i, 105
 following splenectomy, ii, 868
 treatment of, i, 108
 vaginal, ii, 893
- Hemorrhagic diseases, i, 333
- Hemorrhoids, ii, 916
 bleeding following operation, ii, 919
 enemas in treatment, ii, 917
 ulcerations following operation, ii, 918
- Hemostatic measures, i, 337
- Hepatic duct drain, ii, 843
 irrigation through, tube used for drainage, ii, 844
- Hernia cerebri, ii, 687
 exercises for, i, 506
 following appendectomy, ii, 762
 following appendicitis operation, ii, 857
 incisional ventral, ii, 761 (*see* Incisional ventral hernia)
 inguinal, ii, 752
 not frequent following operations on the biliary passages, ii, 848
 patients, instructions to, on leaving hospital, ii, 779
 pregnancies, postoperative, as cause of, ii, 762
 treatment of, ii, 766
 umbilical, ii, 758
- Hiccough, i, 68
 causes of, i, 68
 mechanism of, i, 68
 persistent, of grave import in peritonitis, i, 69
 remedies, i, 71
- Hip, congenital dislocation of, ii, 1032
 joint, arthrodesis, ii, 1028
 arthroplasty, ii, 1028
 or sitz bath, i, 526
- Hoarseness following thyroidectomy, ii, 703
- Hood bandage, i, 448
- Hot and cold douches, alternate, i, 532
 applications, reflex effects of, i, 521
 wet pack, i, 525
- Hot-water bottles, burns from, i, 151
- Howard's method of artificial respiration, i, 343
- Human serum, use of, in controlling hemophilia, i, 338
- Humerus, fracture of, ii, 1025

- Hydatidiform mole, ii, 952
 Hydrocele, ii, 755
 Hydrops, ii, 781
 Hydrostatic effects, i, 521
 Hydrotherapy: i, 519
 after amputation, ii, 983
 alternate hot and cold douches, i, 532
 cold applications, i, 520
 cold douche, i, 531
 cold sitz bath, i, 526
 cold wet pack, i, 525
 heating compresses, i, 524
 hip or sitz bath, i, 526
 hot applications, i, 521
 hot wet pack, i, 525
 ice pack, i, 524
 in sleeplessness, i, 67
 intensity of application, i, 522
 following peripheral nerve injuries, ii, 1006
 fomentation, i, 523
 location of application, i, 522
 prolonged cold sitz bath, i, 527
 reflex effects, i, 520
 salt glow, i, 527
 technic, i, 523
 tonic cold applications, i, 530
 Hydrotherapeutic measures in reduction of obesity, i, 366
 Hygiene in orthopedic surgery, ii, 1013
 Hyperemia in infection of the extremities, ii, 999
 Hypnotics, avoid use of, during reconstruction of patient, i, 637
 Hypnotism in treatment of sleeplessness, i, 66
 to stop hicough, i, 73
 Hypodermolysis, i, 586
 apparatus, i, 589
 for maintaining temperature of fluid, i, 594
 continuous, i, 592
 distilled water, i, 590
 in peritonitis, ii, 786
 needle introduced through square of gauze, i, 590
 quantity of fluid administered, i, 594
 painless, i, 592
 Hypospadias and epispadias, ii, 903
 Hypostatic pneumonia in the aged, i, 651
 Hysterectomy, ii, 890
 for gonorrhea, ii, 894
 infection following, ii, 892
 ligature material, ii, 891
 mental reaction, ii, 890
 prognosis of, ii, 892
 pulmonary embolism following, ii, 894
 vaginal, ii, 979
 Hysterical delirium, i, 227
 headaches, i, 76
 I
 Ice, destruction of skin caused by prolonged application, i, 154
 pack, i, 524
 Idiosyncrasy for morphine, i, 17
 Ileus, i, 126
 classification of, i, 128
 dynamic, i, 128
 mechanical, i, 128
 mechanism and cause of, i, 133
 mortality in, i, 126
 prognosis in, i, 127
 symptoms of, i, 127, 132
 treatment of, i, 127, 133
 Immediate effects of anesthesia and operation, i, 27
 Immobilization following amputation, ii, 981
 Immobilizing bandages, i, 440
 Incarcerated inguinal hernia, ii, 757
 Incision, direction of, in relation to wound healing, i, 403
 for amputation, i, 567
 Incisional ventral hernia, ii, 761
 circumcising old scar, ii, 767
 closing dead space in subcutaneous fat, ii, 777
 dissecting skin scar away from sac, ii, 768
 etiology of, ii, 761
 excising fascia lata flap, ii, 775
 experimental work, ii, 764
 fascial transplantation for, ii, 773
 operation without opening sac preferable, ii, 770
 operative technics, ii, 769
 reducing tendency to hernia, ii, 767
 redundant sac being removed previous to overlapping of resistant tissue, ii, 772
 sac freely exposed, ii, 769
 sac inverted, edges of ring being sutured together, ii, 771
 sac pushed in, demonstrating ring, ii, 770
 second step of overlapping, ii, 774
 suture of skin, ii, 778
 suturing fascia lata, ii, 776
 symptoms of, ii, 765
 treatment of, ii, 766
 Indications for blood transfusion, i, 603
 Infected wounds, early treatment of, i, 410

- Infection following vaginal operations,
ii, 976
or inflammation causing headache, i,
76
role of, in thrombosis, i, 302
with gas bacillus, ii, 1001
- Infections of extremities, ii, 995
antiseptics, ii, 997
closure of wound, ii, 1000
drainage, ii, 996
dressing and baths, ii, 996
hyperemia, ii, 999
immobilization and physiologic
rest, ii, 995
of fascia, ii, 1002
stages of, ii, 995
tetanus following, ii, 1000
treatment, ii, 995
vaccines, ii, 999
of tendons, ii, 1002
- Inflammation of the portal vein, i, 320
- Inguinal hernia, ii, 752
broken position in cases of, ii, 753
dressing for, ii, 754
production of, by ligament opera-
tions, ii, 889
recurrence, ii, 756
wound dressing, ii, 752
- Injuries, gas bacillus infection in, i, 270
in diabetics, i, 240, 241
of the bladder, ii, 909
of the kidney, ii, 911
of the penis, ii, 902
of the scrotum, ii, 905
of the ureter, ii, 910
of the urethra, ii, 903
- Injury to pancreas, ii, 863
- Insane patients, feeding, i, 224
- Insanity, brain cells in, i, 220
exciting causes, i, 218
fear as cause of, i, 219
postoperative, forms of, i, 218
predisposition to, i, 219
prognosis in, i, 219
worry as cause of, i, 219
- Insomnia, i, 61 (*see* Sleeplessness)
- Intercoastal neuralgia, adhesive strap-
ping in, i, 55
- Intestinal anastomosis, stricture com-
plicating, ii, 812
digestion, i, 370
drainage tube, ii, 815
feeding, ii, 815
fistulae, i, 189
causes, i, 190
determining location of, i, 190
prognosis of, i, 191
treatment of, i, 192
obstruction following appendicitis op-
eration, ii, 855
following ligament operations, ii,
889
- Intestinal obstruction—Cont'd.
in children, i, 644
in inguinal hernia, ii, 758
operations, foods and cathartics fol-
lowing, ii, 810
paralysis of the bowel following, ii,
812
peritonitis following, ii, 812
segment, exclusion of an, ii, 823
surgery in ileus, i, 136
toxemia, ii, 788
tract, amount that may be removed
without causing fatal deficien-
cy symptoms, ii, 811
wall, transverse suture of, ii, 820
- Intestine and gall bladder, anastomosis
of, ii, 846
- Intestines, ii, 810
kneading the, i, 492
- Intoxication, acid, i, 232
- Intraabdominal tension, increased, ii,
748
- Intracranial disturbances as cause of
headache, i, 78
- Intralaryngeal insufflation, i, 348
- Intraperitoneal abscess, i, 295
feeding, i, 381
introduction of fluid, i, 588
- Intrathoracic massage of the heart, i,
350
- Intratracheal insufflation of Meltzer and
Auer, i, 348
- Intravenous feeding, i, 378
infusion of salt solution, i, 588
injection of gelatin in salt solution
in hemorrhage, i, 110
- Intubation in children, i, 639
- Iodine burns, i, 150
- Irrigation of infected wounds, i, 427
- Irritating discharges cause sinuses to
persist, i, 200
- Irrigation, avoiding in rectal feeding,
i, 372
- Ischiorectal abscess, ii, 927

J

- Jaundice, obstructive, diet in, i, 361
- Jaw, lower, operations on the, ii, 678
sore, after operation, i, 52
upper, operations on the, ii, 678
- Jejunal ulcer, ii, 805
- Jejunostomy, artificial feeding by, i,
378
- Joint contractures complicating ampu-
tation, ii, 985
disturbances, exercise in, i, 511
- Joints, affections of, ii, 990
hemorrhages in the, i, 334
- Jones' abduction and fixation frame for
the hip, ii, 1020

K

- Kaliski needle, i, 611
- Karewski's operation for hernia, ii, 771
- Kidney, injuries of the, ii, 911
- Kidneys in old age, i, 649
 - part played by, in acidosis, i, 234
- Kineplastic reamputations, i, 572
- Kineplasties, definition of, i, 573
- Kinking of the intestine, i, 130
- Knee joint, derangements of, ii, 1039
 - excision of, ii, 1027
 - splint, Thomas, ii, 1019
- Knock knees and bow legs, ii, 1032
- Kocher and Storp's modified technic of amputation, i, 566

L

- Labor, premature, ii, 951
- Laborde's tongue traction, i, 349
- Lange's test for acetone in urine, i, 236
- Laparotomy predisposes to dilatation of the stomach, i, 119
- Laryngeal muscles, spasm as cause of obstructed respiration, i, 28
- Laryngectomy, ii, 711
 - secondary hemorrhage, ii, 712
- Later subjective symptoms, i, 49
- Lavage following stomach operations, ii, 792
 - immediately after operation to relieve vomiting, i, 30
 - in treatment of ileus, i, 134
 - technic of, ii, 795
- Leg bandages, i, 460
 - cuff and strap for restraining insane patients, i, 222
 - exercises, i, 503
- Leube's diet as modified by Lockwood for gastrostomy, i, 377
- Leucocytes, power of, to kill bacteria, i, 257
- Ligament operations, ii, 888
- Ligation of thyroid vessels, ii, 694
- Ligature material in hysterectomy, ii, 891
- Lips, wounds of the, ii, 676
- Liquid fat discharges from breast wounds, ii, 722
- Litholapaxy, ii, 909
- Lithotomy, suprapubic, ii, 910
- Liver, ii, 826
 - abscess, ii, 826
 - amebic in origin, ii, 830
 - bile in exudate, ii, 827
 - blood in exudate, ii, 827
 - drainage, ii, 827
 - emetin in treatment of, ii, 830
 - position of patient following operation, ii, 827
 - prognosis in, ii, 829

Liver, abscess—Cont'd.

- pus from, ii, 827
- reconstruction of patient following, ii, 829
- recurrence of, ii, 829
- time for removal of drainage tubes, ii, 828
- wound dressing, ii, 826
- in old age, i, 649
- Local anesthesia, complications arising after, i, 46
 - treatment of cystitis, i, 400
- Lochia, ii, 960
- Lumbago, i, 85
- Lumbar backache, i, 83
- Lung, fat embolism of, following multiple fractures, i, 140
- Lungmotor, i, 347
- Lymph and blood, wound healing in regions well supplied by, i, 403
- drainage, ii, 709
- Lymphatics in relation to carcinoma of the breast, i, 541

M

- McBurney gridiron operation, incision in, ii, 856
- McLean's apparatus for proctoclysis, i, 579
- Magnesium sulphate enema, i, 387
- Male, catheterization in, i, 394
- Malignancy, radium in treatment of, i, 535
 - roentgen rays in treatment of, i, 535
- Malignant cystic tumors, ii, 879
 - disease of bones, ii, 1031
 - tumors of the thorax, ii, 724
- Malingering in cases of foreign bodies left in the abdomen, i, 185
- Manual methods of artificial respiration, i, 343
- Mask used for administration of gas and ether combined, i, 21
- Massage, i, 484
 - after amputation, ii, 981
 - after local anesthesia, ii, 47
 - and exercise, i, 483
 - draining the jugular veins, i, 489
 - effect of, on blood, i, 487
 - effect of, on digestive organs, i, 486
 - effect of, on elimination, i, 486
 - effleurage, i, 487
 - friction, i, 494
 - general discussion, i, 484
 - in reduction of obesity, i, 366
 - in treatment of constipation, i, 386
 - muscle nutrition improved by, i, 487
 - of breast, ii, 953
 - of stump after amputation, i, 565
 - petrissage, i, 491
 - physiologic effect of, i, 485

- Massage—Cont'd.
 skin considerations, i, 485
 technique, i, 487
- Mechanical treatment of obesity, i, 366
- Medical treatment of cystitis, i, 398
- Medication, during period of recovery
 from anesthetic, i, 34
 in orthopedic surgery, ii, 1012
 in pneumonia, i, 281
 in preparation for operation, i, 17
- Medicinal treatment for obesity, i, 367
- Medulla, affection of respiratory center in, as cause of respiratory failure, i, 28
- Meltzer's pharyngeal insufflation apparatus, i, 347
- Meningitis, operations for, ii, 685
- Menstruation, backache due to, i, 83
 as cause of headache, i, 78
 reappearance of, following puerperium, ii, 960
- Mental aberration, postoperative i, 45
 changes in old age, i, 648
 readjustment, postoperative, i, 634
- Mesentery, slit in, complications arising from, ii, 815
- Metastatic pneumonia, ii, 807
- Microorganisms that incite septicemia, i, 257
- Migraine, i, 77
- Milk, care of, following difficult labor, ii, 954
- Mineral oil as enema, i, 388
 in treatment of dry mouth, i, 51
- Mixed hemorrhage, i, 103
- Mole, hydatidiform, ii, 952
- Morbid anatomy of burns, i, 154
- Morison's method of antiseptics, ii, 998
- Morphine addicts, i, 205
 given to quiet delirious patient recovering from anesthetic, i, 34
 in preparation for operation, i, 17
 to control pain immediately after operation, i, 36
- Morphinism, symptoms, i, 205
- Mortalities, anesthetics, i, 665
- Mortality in pneumonia, i, 277
 in subdiaphragmatic empyema, i, 298
 of gas bacillus infection, i, 271
 of pulmonary embolism, i, 314
 of surgical diabetes, i, 243
 operative, i, 669
 postoperative, i, 664
 rates from various anesthetics, i, 666
- Motor flap, double, in amputation through the forearm, i, 574
 single, in amputation through the arm, i, 574
- Mouth, cancer of the, radium in treatment of, i, 559
 dryness of, after operation, i, 50
- Movements following amputation, ii, 982
- Mucous fistula following gall bladder drainage, ii, 837
- Mucus, excess of, immediately following operation, as cause of respiratory difficulty, i, 27
- Murphy button, loss of, into viscera, ii, 813
 introduction of, by the transgastric route, ii, 798
- Muscles, nutrition of, improved by massage, i, 487
- Myxedema following removal of all of thyroid tissue, ii, 706
- N
- Narcotic drugs, action of, on organism, i, 206
- Nauheim baths, i, 528
- Nausea (*see* vomiting)
- Nausea and vomiting after general anesthetic, i, 40
 following local anesthetic, i, 46
- Necrosis of the skin flaps in thoracic tumors, ii, 725
- Necrotic liver masses, escape of, in liver abscesses, ii, 828
- Neck bandages, i, 448
 carbuncles on the, ii, 689
 furuncles on the, ii, 688
 gland dissection, ii, 709
 operations upon the, ii, 688
- Needles, breaking of, in peritoneal cavity, i, 179
- Nephrectomy, ii, 912
- Nephritis following anesthesia, i, 247, 249
- Nephropexy, ii, 911
- Nephrotomy, ii, 912
- Nerve centers, effect of hemorrhage, i, 107
- Nerve-blocking as preventive of shock, i, 100
- Nervous delirium, i, 226
 diarrhea, i, 389
- Neurasthenia, headaches accompanying, i, 76
 instructions given patients with, i, 230
- Neurasthenics as surgical risks, i, 220
- Neuritis in diabetes, i, 244
- Neurotic patients, reconstruction of, i, 636
- New growths and diabetes, i, 241
- Nipples, care of the, ii, 957
- Nitrous oxide-oxygen, mortality under, i, 667
- Normal salt solution, and physiologic salt solution, differentiation, i, 582

- Nose, wounds of the, ii, 676
- Novocaine, introduction during hypodermoclysis, i, 593
- Nutrient enema, i, 370
 formula for, i, 372, 373
- Nutrition, artificial, i, 369
 during postoperative treatment, i, 352
 following gynecologic operations, ii, 943
 reeducation, i, 631
- Nutritive enemias, i, 358
- O
- Obese, wound healing in, i, 405
- Obesity, degrees of, i, 362
 diet as means of reduction, i, 363
 exercise in reduction of, i, 366
 hydrotherapeutic measures in reduction of, i, 366
 massage in reduction of, i, 366
 mechanical treatment of, i, 366
 medicinal treatment of, i, 367
 methods of reduction, i, 363
 passive ergotherapy, i, 366
 reduction of, i, 362
- Obstetric operations, after-care of
 bowels, ii, 944
 after-pains, ii, 959
 Caesarean section, ii, 963
 control of pain following, ii, 944
 cystitis following, ii, 947
 final examination following, ii, 959
 lochia following, ii, 960
 nutrition following, ii, 943
 perineal tears, ii, 978
 puerperal wounds, ii, 960
 rest and sleep following, ii, 959
 time of getting up, ii, 959
- Obstetrical and vaginal operations, ii, 942
- Obstetrics, abortion and premature labor, ii, 951
 binder, ii, 958
 care of the nipples, ii, 957
 destructive operations, ii, 952
 forceps deliveries, ii, 952
 versions, ii, 952
- Obturation, i, 130
 ileus, i, 131
- Ocular headache, i, 74, 77
- Oertel's dietary for obesity, i, 364
- Oil, mineral, as substitute for saliva in dry mouth, i, 51
- Old age, changes in cardiovascular system in, i, 648
 changes in respiratory apparatus in, i, 648
 diet in, i, 653
 kidneys in, i, 649
- Old age—Cont'd.
 liver in, i, 649
 mental changes in, i, 648
 postoperative treatment in, i, 647
 salient features in treatment in, i, 651
 skin changes in, i, 647
 urinary retention in, i, 653
- Omentum, prolapsed, i, 173
- Open wounds, early treatment of, i, 410
- Operating table, removing patient from, i, 23
- Operation for peripheral nerve injuries, ii, 1004
 immediate effects of, i, 27
- Operations in carcinoma of the breast, i, 540
 for incisional ventral hernia, ii, 769
 intestinal, ii, 810
 on the bile ducts, ii, 843
 on the liver, ii, 826
 on the neck, ii, 688
 on the thorax, ii, 713
- Operative mortality, i, 669
- Opisthotonus, i, 266
- Opium as drug habit, i, 205
- Oral cavity, operations about, ii, 678
- Organic headaches, i, 78
- Orthopedic cases, physiotherapy, ii, 1020
 patients, postoperative treatment, ii, 1011
 surgery, diet and medication in, ii, 1012
 complications, ii, 1012
 fixation in, ii, 1013
 fresh air and hygiene, ii, 1013
 pain in, ii, 1011
 tuberculosis of the spine, ii, 1036
- Osteomyelitis, ii, 991, 1031
 acute form, ii, 992
 chronic, ii, 993
- Osteoplastic flaps, about the cranium, ii, 684
 reamputation, i, 565
- Otitis media in diabetes, i, 242
- Ovarian cyst, paracentesis preceding removal, ii, 877, 878
 cystic tumor, ii, 875
 dermoid tumor, postoperative care, ii, 875
 stump, ligature on, ii, 879
- Ovaries, ii, 873
 removal of, after-treatment, ii, 874
 deficiency symptoms following, ii, 874
 special consideration of, during child-bearing period, ii, 873
- Oxygen inhalation as respiratory stimulant, i, 350

P

- Packing the uterus, ii, 972
- Padding for plaster of Paris cast, ii, 1016
- Paget's disease, radium in treatment, i, 559
- Pain about operative wound, i, 38
 control of, following obstetric operations, ii, 944
 in orthopedic surgery, ii, 1011
 following local anesthetic, i, 47
 following rectal surgery, ii, 915
 in amputation, i, 38
 influence of weather on, i, 38
 more following abdominal operations, i, 36
 postoperative, i, 36
 produced by splints, i, 37
 time of day as influence, i, 38
 under plaster casts, i, 37
- Painful stumps, following amputations, ii, 984
 tongue, i, 51
- Pancreas, ii, 861
 cancer of the, ii, 866
 cysts of the, ii, 866
 extirpation, ii, 861
 injury to, ii, 863
 position and relation of, ii, 862
 prolapse of, ii, 861
- Pancreatitis, acute, ii, 863
 chronic, ii, 864
 subacute, ii, 864
- Papilloma, anal, ii, 925
- Paraentesis needle, ii, 877
 preliminary to ovarian cyst removal, ii, 878
- Paraffin coated cylinder for collection of blood, i, 619
- Paralysis agitans, i, 517
 anesthesia, i, 55
 exercise in, i, 515
 of nerves of both arms, postoperative, i, 56
 of the stomach due to disturbed innervation, i, 120
 of the stomach following operations, ii, 792
 of the vocal cord, ii, 701
- Paresis of the bowel following intestinal operations, ii, 812
- Parotid fistulae, i, 194
- Parotitis, i, 287
 predisposing causes, i, 288
 prognosis, i, 290
 symptoms, i, 289
 treatment of, i, 291
- Passive ergotherapy in reduction of obesity, i, 366
- Patella, kneading the, i, 490
 recurrent dislocations of, ii, 1039
- Pathogenesis of embolus, i, 311
- Pathology of burns, i, 154
 of dilatation of the heart, i, 115
- Pattinson's plaster bandage rolling machine, i, 463
- Pelvic abscess, ii, 979
 operations, instructions given to patients after, ii, 897
 organs of the female, ii, 873
- Penis, amputation of, ii, 903
 injuries of the, ii, 902
- Percy transfusion tube, i, 622
- Perineal tears, ii, 978
 prostatectomy, ii, 908
- Periodic drunkard as surgical risk, i, 212
- Periosteum and bone flap elevated in amputation, i, 568
- Peripheral nerve injuries, ii, 1002
 after-treatment, ii, 1005
 massage and mechanical treatment, ii, 1005
 operative procedures, ii, 1004
 symptoms, ii, 1002
- Peritoneal cavity, foreign bodies lost in, i, 175
 gauze packing in, ii, 885
 lacerations and episiotomy wounds, ii, 961
 operations, adhesions following, ii, 790
 position of patient after, ii, 784
- Peritoneum, ii, 781
 tuberculosis of the, ii, 790
- Peritonitis, ii, 781
 acute septic, ii, 782
 as result of injury of sigmoid during operation, ii, 882
 chronic, ii, 789
 diet in, ii, 787
 dietetic problem in, i, 360
 drainage in, ii, 783
 encapsulated, ii, 789
 following intestinal operation, ii, 812
 hiccough in, i, 69
 loss of body fluid must be compensated for, ii, 786
 preventing the spread of, ii, 785
 tuberculous, ii, 791
 wound dressings in, ii, 787
- Petrissage, i, 491
- Petrolatum liquidum in treatment of dry mouth, i, 51
- Phagocytosis in healing of infected wounds, i, 405
- Phlegmasia alba dolens in gynecologic operations, ii, 946
- Physiotherapy in orthopedic cases, ii, 1020
- Physiologic disturbance in relation to postoperative feeding, i, 352

Physiologic—Cont'd.

- effect of exercise, i, 499
- effect of massage, i, 485
- effect of vibration, i, 496
- saline solution for proctocoelosis, i, 581
- Piles, ii, 916 (*see* Hemorrhoids)
- Placenta previa, Cesarean section for, ii, 964
- Plaster bandage rolling machine, i, 463
 - cast, box for supporting patient during application, i, 467
 - fenestrum for dressing wound, i, 471
 - preliminary preparation for, i, 469
 - split for temporary removal, i, 473
 - casts, applying, i, 468
 - pain under, i, 37
 - of Paris bandages, i, 462
 - device for expressing water from, i, 466
 - device for immersing, i, 465
 - wrapping in tissue paper, i, 464
 - body cast, ii, 1026
 - cast cutter, ii, 1014, 1015
 - cast, for fracture on the tibia, ii, 1021
 - instruments for application, ii, 1015
 - in orthopedic surgery, ii, 1013
 - padding for, ii, 1016
- Plastic flaps from the scalp, ii, 683
 - operations, gynecologic, ii, 975
 - bowels following, ii, 976
 - diet in, ii, 976
 - removal of sutures, ii, 976
- Plethora, danger of, in blood transfusion, i, 623
- Pleurisy, i, 284
 - as cause of painful respiration, i, 54
 - symptoms, i, 284
 - treatment of, i, 284
- Pneumonia, i, 273
 - classification of, i, 273
 - complicating urinary surgery after-treatment, ii, 901
 - dry cupping in, i, 279
 - ether as cause of, i, 275
 - exposure of body in preparation for operation as cause of, i, 276
 - incidence of, i, 273
 - metastatic, ii, 807
 - mortality in, i, 277
 - predisposing factors, i, 275
 - prognosis in, i, 276
 - symptoms of, i, 277
 - treatment of, i, 278
- Pneumothorax, chronic, ii, 745
- Poisoning from local antiseptics, i, 329
- Poliomyelitis, anterior, exercise in, i, 515
- Politzer bulb. use of, in gastric lavage, i, 44
- Portal vein, i, 321
 - tributaries of, i, 320
- Posey's technic for treatment of ether conjunctivitis, i, 50
- Position as respiratory stimulant, i, 350
 - changing of, in treatment of dilatation of the stomach, i, 124
 - faulty, on operating table, as cause of obstructed respiration, i, 28
 - of patient in bed immediately after operation, i, 32
 - of patient in liver abscess, ii, 827
 - of patient in peritonitis, ii, 874
- Posthospital examination record, i, 14
- Postoperative and postpartum hemorrhage, ii, 971
 - backache, i, 82
 - burns, i, 150
 - care of the bowels, i, 383
 - cases, charts and records in, i, 7
 - ideal room for, i, 1
 - diet list, i, 359
 - exercise and massage, i, 483
 - feeding, i, 352
 - headache, i, 74
 - heat stroke, i, 147
 - ileus, i, 126
 - mortality, i, 664
 - orders chart, i, 9
 - parotitis, i, 287
 - pneumonia, i, 273
 - prolapse of abdominal viscera, i, 170
 - psychoses, i, 217
 - retention of urine, i, 393
 - respiratory failure, i, 27
 - room, ideal, i, 1
 - skin eruptions, i, 325
 - sleeplessness, i, 61
 - stomach fistulae, i, 188
 - tetanus, i, 261
 - thrombophlebitis, i, 300
 - treatment by radium and the roentgen rays in malignancy, i, 535
 - in children, i, 638
 - in old age, i, 647
 - of carcinoma of the uterus with radium, i, 547
 - vomiting, i, 30
- Postpartum and postoperative hemorrhage, ii, 971
- Posture during drainage in appendicitis, ii, 852
 - exercise to improve, i, 501
 - for shock and hemorrhage where respiratory apparatus is full of mucus, i, 111
- Postures, role of, in backache, i, 86
- Pott's fracture, ii, 1022
 - brace for, ii, 1023
- Preexisting sepsis as factor in wound healing, i, 405

- Pregnancies, consideration of future, in
ligament operations, ii, 889
following Cesarean section, ii, 968
postoperative, as cause of hernia, ii,
762
ruptured tubal, ii, 887
- Preliminary considerations in surgical
cases, i, 15
- Premature labor, ii, 951
- Preoperative measures that aid in post-
operative feeding, i, 355
- Preparation for the operation, i, 16
- Pressure as cause of paralysis, i, 59
bandages, i, 440
exercise following amputation, ii, 981
negative, within the pleural cavity,
ii, 741
within the chest in empyema, ii, 740
- Prevention of anesthesia paralysis, i,
58
of foreign body being lost in perito-
neal cavity, i, 182
- Preventive treatment of delirium tre-
mens, i, 214
- Primary hemorrhage, i, 103
- Proctoeclysis, i, 577
Elbrecht's device for, i, 578
glucose for, i, 584
gravity method best, i, 580
instruments, i, 577
Newman's device for, i, 579
of tap water to relieve thirst, i, 40
physiologic saline solution for, i, 581
saline solution in large amounts in-
jurious to tissues, i, 582
temperature of fluid for, i, 580
to control thirst in dilatation of the
stomach, i, 124
- Prognosis in pneumonia, i, 276
in hemophilia, i, 336
in ileus, i, 127
in postoperative psychoses, i, 219
in subdiaphragmatic empyema, i, 298
of acute dilatation of the stomach, i,
122
of bacteriemia, i, 258
of burns, i, 159
of fecal fistulae, i, 190
of foreign bodies lost in the peri-
toneal cavity, i, 182
of parotitis, i, 290
of prolapse of abdominal viscera, i,
173, 174
- Prolapse of abdominal viscera, i, 170
of pancreas, ii, 861
of rectum, ii, 928
- Prolapsed omentum, i, 173
- Prophylactic measures for bowel move-
ments, i, 386
treatment of cystitis, i, 398
- Prostatectomy, perineal, ii, 908
suprapubic, ii, 905
- Prostatic hypertrophy, in the aged, i,
654
- Prostration, heat, i, 149
- Protective mechanism of the body
against bacteria, i, 255
- Protein in postoperative diet, i, 356
- Pruritus ani, ii, 926
- Pseudoileus, i, 126
- Psoas abscesses, ii, 1037
- Psychic influence over pain, i, 37
- Psychoses, postoperative, i, 217 (*see*
Insanity)
- Pubiotomy, ii, 969
- Puerperal insanity, ii, 966
wounds, ii, 960
- Puerperium, conduct of, in general, ii,
958
reappearance of menstruation follow-
ing, ii, 960
- Pulmonary edema, i, 283
treatment of, i, 283
emboli removed at autopsy, i, 311
embolism, i, 309
a sequence to thrombophlebitis, i,
309
following hysterectomy, ii, 894
following obstetric operations, ii,
947
frequency of, i, 313
mortality of, i, 314
symptoms of, i, 315
treatment of, i, 317
pressure due to forced artificial res-
piration, effect of, on heart,
i, 115
- Pulmotor to produce respiration, i, 347
- Pulse changes a sign of death, i, 657
- Purulent appendicitis, ii, 853
arthritis, ii, 1030
- Pus appendix, ii, 852
collections, secondary, in appendicitis,
ii, 855
from liver abscess, character of, ii,
827
sinus, ii, 854
- Pyelotomy, ii, 911
- Pylephlebitis, i, 320
definition of, i, 320
occurrence, i, 320
symptoms of, i, 321
technic of operation for, i, 323
treatment of, i, 321
- Pyloric stenosis in children, i, 642
- Pylorus, exclusion of, ii, 799

R

- Radium and roentgen rays in malig-
nancy, i, 535
in treatment of cancer of the mouth
and throat, i, 559

Radium—Cont'd.

- in treatment of cancer of the prostate and bladder i, 552
- in treatment of carcinoma of the rectum, i, 550
- in treatment of carcinoma of the uterus, i, 545
- in treatment of epithelioma, i, 552
- in treatment of Paget's disease, i, 559
- in treatment of sarcoma, i, 561, 562
- in uterine carcinoma, dosage, i, 549
- screening, i, 549
- therapeutic value of, i, 536
- treatment, electric coagulation following, i, 560

Rash, ether, i, 326

septic, i, 326

Reactionary hemorrhage, i, 104

Reamputation, i, 564

- avoidance of, by careful primary amputation, i, 564
- bone flap sutured in place, i, 569
- Chapple's method, i, 569, 570
- flapless method of, i, 571
- general considerations, i, 564
- kineplastic, i, 572
- Kocher and Storp's technic, i, 566
- osteoplastic, i, 565
- periosteum and bone flap elevated, i, 568
- skin incision, i, 566

Reconstruction of the common bile duct, ii, 847

- of the patient, i, 630
- dietary in, i, 632
- exercise in the, i, 633
- fear to be overcome, i, 635
- following liver abscess, ii, 829
- hypnotics to be avoided, i, 637
- mental readjustment, i, 634
- neurotic cases, i, 636
- overcaution a danger, i, 636

Record of posthospital examinations, i, 14

Records and charts in postoperative cases, i, 7

- Rectal administration of food, i, 370
- and anal lesions, ii, 914
- excision, blood loss during, ii, 931
- bowel movements following, ii, 933
- diet following, ii, 938
- infection following, ii, 935
- Kraske, ii, 934, 935
- passing of bougie following, ii, 933
- sacral anus formed following, ii, 936
- time patient should remain in bed, ii, 934
- wound healing in, ii, 938
- wound treatment following, ii, 932

Rectal—Cont'd.

- feeding, i, 358
- essential points in, i, 371
- formulae for, i, 372, 373
- prevention of irritation in, i, 372
- tips devised by Elbrecht, for proctocolysis, i, 578
- umbrella tampon tube, ii, 920
- Rectovaginal fistula, ii, 940
- Rectovesical fistula, ii, 939
- Rectum, administration of fluid through, i, 577
- and anus, fistulous tracts involving, ii, 922
- carcinoma of the, radium in treatment of, i, 550
- excision of the, ii, 931
- general principles in postoperative care of, ii, 915
- pain following operation, ii, 915
- prolapse of, ii, 928
- stricture of the, ii, 930
- Recurrence of goiter, ii, 708
- Recurrent bandage for head, i, 443
- dislocation of the shoulder, ii, 1034
- roller bandage for stump, i, 445, 446
- Reduction of obesity, i, 362
- Reeducation, nutritional, i, 631
- Reflex effects of hydrotherapy, i, 520
- vomiting, i, 42
- Refraction, errors in, as cause of sleeplessness, i, 64
- Renal calculi in children, i, 645
- function, determination of, ii, 899
- interfered with during administration of ether, i, 248
- Respiration, artificial, i, 343
- in empyema, ii, 742
- obstructed, faulty position on operating table as cause of, i, 28
- mucus as cause of, i, 27
- spasm of laryngeal muscles as cause of, i, 28
- painful, i, 54
- Respiratory apparatus, changes in, in old age, i, 648
- difficulties, immediately postoperative, i, 27
- disorders, treatment of, i, 28
- failure, affection of respiratory center in medulla as cause of, i, 28
- complicating cranial operations, ii, 686
- due to presence of foreign body, treatment of, i, 29
- stimulant, adrenalin, i, 350
- stimulation by sodium cyanide, i, 350
- by electricity, i, 350
- Resistive exercises i, 497
- Rest and sleep following obstetric operations, ii, 959

Rest—Cont'd.

- following vaginal operations, ii, 977
- Restraining hands and feet of insane patients, i, 228
- insane patients, i, 222
- by means of a sheet, i, 229
- Restraint in delirium tremens, i, 215
- Resuscitation, i, 343
- Retention of urine, treatment of, i, 393
- Röntgen ray treatment of carcinoma of breast, i, 537
- Röntgen rays, areas for raying the breast, i, 543
- dosage, i, 542
- in malignancy, i, 535
- in treatment of sarcoma, i, 562
- therapeutic value of, i, 536
- Röntgenization of the lymphatic glands supplementing radium therapy, i, 560
- Röntgenologist, cooperation between surgeon and, i, 542
- Roller bandage, applying, i, 442
- Room, ideal postoperative, i, 1
- Rubber tube drains in peritonitis, ii, 784
- Ruptured tubal pregnancy, after-care of, ii, 887
- Rusty forceps removed from abdomen at a remote period, i, 180

S

- Sacral anus, formation of, ii, 936, 937
- Sacrocoecygeal route for rectal excision, ii, 935
- Saline solution, large quantities injurious to tissues, i, 582
- Salivary glands, inflammation of, i, 287
- Salpingitis, double, prognosis in, ii, 886
- Salt glow, i, 527
- solution, intravenous infusion, i, 588
- Sarcoma of nasopharynx, amenable to radium treatment, i, 561
- radium in treatment of, i, 562
- roentgen rays in treatment of, i, 562
- Sarcomatous change in fibromyoma of the uterus, ii, 894
- Scarlet fever, postoperative, i, 327
- Scars, avoidance of, i, 408
- complicating amputation, ii, 985
- following thyroidectomy, ii, 707
- in and about the trachea, ii, 693
- Schäfer's prone-pressure method of artificial respiration, i, 346
- Scissors, bandage, i, 442
- Seoliosis, ii, 745
- Scopolamine, mortality under, i, 668
- Screening radium, i, 549
- Scrotum and penis, inflamed, glycerin pack for, i, 412
- and testicles, support for, ii, 754
- injuries of the, ii, 905
- Sebaceous cysts about cranium, ii, 683
- Secondary hemorrhage, i, 105
- removal of the gall bladder, ii, 838
- Sedatives in the urinary surgery, ii, 900
- Senile delirium, i, 227
- gangrene, ii, 986
- Senility (*see* Old age)
- Septic diarrhea, i, 390
- infection, i, 255
- general, following liver abscess, ii, 829
- processes in diabetes, i, 242
- rash, i, 326
- treatment of, i, 326
- Serum sick, i, 339, 340
- Shallow bath, i, 531
- Sheet bath, i, 530
- Shield for exposing small surfaces, i, 423
- Shock, i, 91
- and hemorrhage, care of, after operation, i, 31
- blood transfusion in treatment of, i, 99
- cardiac failure as cause of, i, 94
- experimental work in, i, 97
- following rectal excision, ii, 931
- following removal of fallopian tubes, ii, 883
- from cranial operations, ii, 686
- in old age, i, 650
- nerve-blocking as preventive, i, 100
- position of patient in treatment of, i, 101
- theories concerning, i, 91
- treatment of, i, 98
- vasomotor exhaustion as cause of shock, i, 93
- Shoulder, arthrodesis of the, ii, 1036
- bandages, i, 450
- joint, excision of the, ii, 1035
- impaired functional mobility of, ii, 729
- recurrent dislocation of the, ii, 1034
- stiff, ii, 1033
- Sick headache, i, 77
- Sigmoid divided with a cautery, ii, 821
- Silkworm strands for serous drainage, ii, 717, 718
- Silvester-Howard method of artificial respiration, i, 345
- Silvester's method of artificial respiration, i, 344
- Single motor flap in amputation through the arm, i, 574
- Singultus, i, 68
- gastritis nervosus, i, 69
- Sinus, pus, ii, 854
- Sinuses, i, 199
- about the mouth and neck, i, 201
- bismuth paste in treatment of, i, 201
- definition of, i, 199

Sinuses—Cont'd.

- following amputation, ii, 984
- frequently seen after operations, i, 199
- germicide gas in treatment of, i, 202
- irritating discharges cause persistent, i, 200
- nonabsorbable ligature material as cause of, i, 199
- persistent, after cause is removed, i, 200
- leading to depths of pelvis, ii, 881
- treatment of, i, 200

Sitz bath, i, 526

Skin affections complicating fecal fistula, i, 192

- care of, following Cæsarean section, ii, 967
- changes in old age, i, 647
- consideration of, in massage, i, 485
- eruptions, i, 325
 - drugs causing, i, 328
- grafting, ii, 1008
 - in thoracic tumor operation, ii, 726
 - Reverdin's method, ii, 1008
 - Steele's method, ii, 1008
 - Thiersch's method, ii, 1008
 - Wolfe's method, ii, 1008

- grafts, for burned surface, i, 161
- protection of, during hepatic duct drainage, ii, 844

Sleep, theories of, i, 65

- Sleeplessness at night caused by napping during day, i, 61
- caused by errors in refraction, i, 64
- caused by lack of food, i, 62
- caused by loaded rectum, i, 64
- drug treatment, i, 67
- hydrotherapy in treatment, i, 67
- hypnotism in treatment of, i, 66
- in postoperative patients, i, 61
- worry a cause of, i, 62

Sling run through rubber tube to protect neck from pressure, i, 457

Sodium citrate mixed with blood to prevent clotting, i, 608

- cyanide, respiratory stimulation by, i, 350

Sore jaw, after operation, i, 52

- throat, after operation, i, 53
- following thyroidectomy, ii, 696

Spasm of laryngeal muscles as cause of obstructed respiration, i, 28

Spastic type of paralysis, i, 517

Special hospital record, i, 10

Spica cast, ii, 1024

Spinal anesthesia, mortality under, i, 667

- urinary changes following, i, 247

Spine, tuberculosis of the, ii, 1036

Spleen, ii, 868

- in relation to anemia, ii, 872

Spleen—Cont'd.

- removal of, ii, 868

Splenectomy, ii, 868

- anemia following, ii, 870
- control of blood supply during, ii, 869
- decrease in bactericidal properties of blood following, ii, 871
- secondary hemorrhage following, ii, 868
- ultimate results of, ii, 870

Splenic enlargement, ii, 871

Splints, pain produced by, i, 37

Split rubber tube drain, i, 430

Sprains and dislocations, exercise in treatment, i, 511

Stains for tetanus bacillus, i, 262

Starvation period, postoperative, i, 354

Steam, apparatus for generating, ii, 698

- goiter operation, inhaling, soon after, ii, 697
- inhalations of, before patient is fully awake from anesthetic, i, 32

Steele's method of skin grafting, ii, 1008

Stenosis, tracheal, ii, 693

Stercoral diarrhea, i, 390

Sternomastoid muscle, loss of, ii, 710

Sterile water employed for hypodermoclysis, i, 590

Stiff-legged brace, ii, 1018

Stiff shoulder, ii, 1033

Stimulation of the circulation, i, 349

Stitching the wound, i, 408

Straight jacket, i, 230

Strangulation, relief of, i, 137

Stretcher for carrying patient from operating table to bed, i, 24, 25

Stricture of common bile duct, ii, 847

- complicating intestinal anastomosis, ii, 812
- of the esophagus in children, i, 642
- of the rectum, ii, 930

Strictures as cause of ileus, i, 132

- following rectal excision, ii, 934

Stomach, ii, 792

- acute dilatation of, i, 118
- blood accumulation in, postoperative, ii, 792

- cancer of the, ii, 805

fistulae, i, 188

incision of wall, ii, 798

lavage, paraphernalia for, ii, 793

operations, instruction to patients following, ii, 808

paralysis of, postoperative, ii, 792

secondary ulcers at the stoma, ii, 804

tube, ii, 794

- use of, for relief of vomiting, i, 42

ulcer, ii, 800

- diet following operation for, ii, 801, 802

Stomach ulcer—Cont'd.
 superacidity, ii, 800
 Stump, arm, apparent lengthening of,
 i, 572
 heel an example of proper weight
 bearing, i, 566
 recurrent roller bandage for, i, 445,
 446
 Subcutaneous administration of fluid, i,
 588
 feeding, i, 379
 Subdeltoïd bursitis, ii, 1033
 Subdiaphragmatic abscess, contents of,
 i, 296
 more prevalent in men, i, 295
 empyema, i, 295
 causes of, i, 295
 mode of infection, i, 295
 mortality, i, 298
 prognosis of, i, 298
 symptoms, i, 296
 treatment of, i, 297
 Subjective manifestations, earliest, i, 36
 Subphrenic abscess, i, 295
 Suction cupping device, i, 425
 in wound treatment, i, 424
 Sudden death, i, 659
 Suppurating appendicitis, ii, 851
 cases of fracture, ii, 989
 Suprapubic lithotomy, ii, 910
 prostatectomy, ii, 905
 Surgery, diabetes in, i, 239
 in its relation to surgery, i, 211
 of the abdomen, ii, 748
 of the extremities, ii, 981
 Surgical cases, preliminary considera-
 tions, i, 15
 patients, drug addiction in, i, 204
 Suspensory bandages, i, 461
 Suture removal, i, 409
 Sutures, tension, ii, 749
 Swallowing of air as cause of dilatation
 of the stomach, i, 121
 Sweating after operation, i, 34
 Symptoms and signs of impending
 death, i, 656
 of acid intoxication, i, 235
 of acute dilatation of the stomach, i,
 123
 of bacteriemia, i, 258
 of cystitis, i, 397
 of delirium tremens, i, 213
 of erysipelas, i, 331
 of foreign bodies in the abdomen, i,
 181
 of gas bacillus infection, i, 270
 of ileus, i, 127, 132
 of incisional ventral hernia, ii, 765
 of parotitis, i, 289
 of pleurisy, i, 284
 of pneumonia, i, 277
 of pulmonary embolism, i, 315

Symptoms—Cont'd.
 of pylophlebitis, i, 321
 of subdiaphragmatic empyema, i, 299
 of tetanus, i, 265
 of thrombophlebitis, i, 303
 of uremic coma, i, 252
 systemic, in burns, i, 156
 Syncope during or after anesthesia, i,
 30
 Syphilis of the bone, ii, 991
 Systemic effects of alcoholism, i, 212

T

Tampon tube, rectal, ii, 919
 Tapotement of percussion, i, 494
 Taylor back brace, ii, 1017
 T-bandages, i, 461; ii, 916
 Tea habit in surgical patients, i, 209
 Tear of the external sphincter ani, ii,
 941
 Technic of blood transfusion, i, 604
 of massage, i, 487
 Teeth, carious, as cause of headache, i,
 77
 Temperature, effect of, upon the body,
 i, 519
 of fluid for proctocolysis, i, 580
 Temporomandibular joint, operations
 on, ii, 679
 Tendons, infections of, ii, 1002
 transference, ii, 1037
 Tenosynovitis, ii, 1002
 Tension, influence of, on wound healing,
 i, 404
 strips of adhesive, abdominal, ii, 750
 sutures, abdominal, ii, 749
 to be avoided, i, 60
 Testicles and scrotum, support for, ii,
 754
 Tests for acetone, i, 236
 Tetanus, i, 261
 bacillus, i, 262
 distribution of, i, 264
 complicating operations on fecal fis-
 tulæ, i, 192
 following infection of the extremities,
 ii, 1000
 infection, catgut as source of, i, 263
 more frequent in certain localities, i,
 261
 sources of infection, i, 263
 symptoms of, i, 265
 treatment of, i, 266
 Tetany following thyroidectomy, ii, 705
 Therapeutic fistulæ, i, 189
 value of radium, i, 536
 Thiersch's method of skin grafting, ii,
 1008
 Thigh, bandages of the, i, 459
 Thirst, common after general anesthet-
 ic, i, 39

- Thirst—Cont'd.
 following dehydration, i, 586
 in dilatation of the stomach, i, 124
- Thomas extension knee splint, ii, 1019
- Throat, cancer of the, radium in treatment of, i, 559
 sore, after operation, i, 53
- Thrombosis, i, 300
 and embolism in gynecologic operations, ii, 945
 of the mesenteric vessels, i, 129
 bacteriemia as cause of, i, 303
 chemical changes causing, i, 302
 definition of, i, 301
 infection in, i, 302
 in inguinal hernia, ii, 758
 injury to vessel wall as cause of, i, 302
 mechanism of, i, 301
 slowing of blood stream as cause of, i, 303
- Thromboplastin solution, application of, to stop hemorrhage, i, 109
- Thrombophlebitis, i, 300
 occurrence of, i, 300
 pulmonary embolism following, i, 309
 symptoms of, i, 303
 treatment of, i, 305
- Thoracic duct, fistulæ of, i, 194
 operations, empyema, ii, 732
 tumors, drainage of, ii, 725
 necrosis of the skin flaps, ii, 725
 viscera, diseases of, as cause of hicough, i, 70
- Thorax, malignant tumors of, ii, 724
 (*see* Thoracic tumors)
 operations on the, ii, 713
- Thyroid vessels, ligation of, ii, 694
- Thyroidectomy, ii, 695
 hemorrhage, reactionary, ii, 695
 technic illustrated, ii, 699
- Tibia, fracture of, cast for, ii, 1021
- Time preferable for operation, i, 18
- Titration of chloride of lime, i, 418
 of Dakin's solution, i, 418
- Tobacco habit in surgical patients, i, 209
- Tongue, painful, i, 51
- Tonic cold applications, i, 530
 contracture of muscle in tetanus, i, 265
- Tonsils and adenoids, removal of, i, 640
- Towel bandage for hand, i, 458
 for head, i, 444
 chest bandages, i, 452
- Toxic symptoms following blood transfusion, i, 601
- Trachea, granulomata of the, ii, 693
 scars about, ii, 693
 stenosis of, ii, 693
- Tracheal tube, emergency, ii, 691
- Tracheotomy, ii, 691
 cosmetic results, ii, 693
 hemorrhage after, ii, 693
- Traction on an extremity, ii, 987
- Transfusion, blood, i, 596 (*see* Blood transfusion)
- Transplantation of bone, i, 435
 of cartilage, i, 435
- Treatment chart, i, 12
 of acid intoxication, i, 237
 of acute dilatation of the stomach, i, 124
 of anuria, i, 250
 of bacteriemia, i, 259
 of bedsores, i, 167
 of cystitis, i, 396, 398
 of delirium tremens, i, 214
 of diabetes before operations, i, 243
 of dilatation of the heart, i, 116
 of drug addiction, i, 206
 of drug eruption, i, 330
 of erysipelas, i, 332
 of fat embolism, i, 143
 of fecal fistulæ, i, 192
 of fistulæ, i, 187
 of foreign bodies lost in the peritoneal cavity, i, 185
 of gas bacillus infection, i, 271
 of headache, i, 79
 of hemophilia, i, 336
 of hemorrhage, i, 108
 of hernia, ii, 766
 of ileus, i, 127, 133
 of parotitis, i, 291
 of pleurisy, i, 284
 of pneumonia, i, 278
 of postoperative psychoses, i, 229
 of pulmonary embolism, i, 317
 of pyelephlebitis, i, 321
 of respiratory failure, i, 28
 of retention of urine, i, 393
 of septic rash, i, 326
 of shock, i, 98
 of sinuses, i, 200
 of subdiaphragmatic empyema, i, 297
 of tetanus, i, 266
 of thrombophlebitis, i, 305
 of wounds, i, 401
- Trendelenburg position as aid in replacing prolapsed organs, i, 175
 effect of, on heart, i, 114
- Tributaries of the portal vein, i, 320
- Trigonal hyperemia, ii, 909
- Trigonitis or trigonal hyperemia, ii, 909
- Trochar and cannula for introducing tube through intercostal space, ii, 735
- Trunk exercises, i, 503
- Tuberculous fallopian tubes, ii, 887
 glands, removal of, in children, i, 639
 lesion, sinus formation caused by drainage of, i, 199

- Tuberculous—Cont'd.
 peritonitis, after-treatment, ii, 791
 Tuberculosis, extension of, from neck
 gland to lungs, ii, 711
 of the bone, ii, 991
 of the peritoneum, ii, 790
 of the spine, ii, 1036
 Tuboovarian abscess, postoperative
 care, ii, 879
 Tumors, breast, benign, ii, 718
 large, as cause of backache, i, 86
 malignant, of the thorax, ii, 724

U

- Ulcer, jejunal, ii, 805
 of the stomach, ii, 800
 Ulceration complicating amputation, ii,
 985
 Ulcerations following hemorrhoids, ii,
 918
 Ulcers, secondary, ii, 804
 Umbilical fistula, i, 195
 hernia, ii, 758
 recurrences, ii, 759
 Umbrella tampon tube, rectal, ii, 921
 Una's mixture, i, 411
 Ununited fractures, ii, 990
 Upper extremity, bandages for the, i,
 456
 Uremic coma following anesthesia, i,
 247, 251
 symptoms of, i, 252
 Ureter, injuries of the, ii, 910
 injury to the, from operations in
 the pelvis, ii, 893
 Urethra, injuries of the, ii, 903
 Urethrotomy, ii, 903
 Urinary antiseptic, ii, 900
 findings following anesthesia, i, 247
 retention, in the aged, i, 653
 surgery, elimination important fol-
 lowing, ii, 899
 pneumonia complicating after-
 treatment, ii, 901
 sedatives following, ii, 900
 tract, fistulae of the, i, 196
 Urine, retention of, i, 393 (*see* Reten-
 tion of urine)
 Urologic conditions, postoperative treat-
 ment of, ii, 899
 Uterine cancer, ii, 895
 acetone treatment of, ii, 896
 operations, position in bed following,
 ii, 888
 packing, ii, 972
 instrument, ii, 974
 Uterus, ii, 888
 carcinoma of, radium in treatment
 of, i, 545
- Uterus—Cont'd.
 care of, following Cesarean section,
 ii, 964
 fibromyoma of the, ii, 894

V

- Vaccines in infections of the extremi-
 ties, ii, 999
 Vaginal and obstetrical operations, ii,
 942
 Cesarean section, ii, 969
 hemorrhage, ii, 893
 hysterectomy, ii, 979
 operations, after-care of bowels, ii,
 944
 diet following, ii, 913
 infection following, ii, 976
 rest following, ii, 977
 treatment of uterine cancer, ii, 896
 wounds, changing of dressing, ii, 945
 Valvulus, i, 130
 Varicose ulcer, grafts over, i, 435
 veins, ii, 1006
 and embolism, i, 312
 dressings for, ii, 1007
 Vascular hypertension of uremia, cause
 of, i, 252
 Vasomotor exhaustion as cause of
 shock, i, 93
 Velpeau bandage, i, 455
 Venesection in treatment of fat embol-
 ism, i, 144
 Ventral hernia, incisional, ii, 761
 Vesico-vaginal fistulae, ii, 970, 978
 Vessel walls, injury to, as cause of
 thrombosis, i, 302
 Vibration, i, 495
 appliances, i, 496
 physiologic effect, i, 496
 Vocal cord, paralysis of the, ii, 701
 Volkmann's paralysis due to pressure
 ischemia, i, 59
 Vomiting, administration of water by
 mouth during, i, 42
 after anesthesia, i, 30
 body movement tends to increase,
 i, 43
 and nausea, after general anesthetic,
 i, 40
 gastric lavage for relief of, i, 43
 irritation of peripheral branch of
 vagus nerve, as cause of, i, 41
 renal complications as cause of, i, 42
 stomach tube, use of, for relief, i,
 42, 43
 Vomitus, inspired, as cause of respira-
 tory difficulties after opera-
 tion, i, 27
 Von Noorden's dietary in obesity, i, 364

W

- Ward carriage to receive patient from operating table, i, 25
- Washing an eye irritated during anesthesia, i, 33
- Water, administration of, postoperative, i, 357
 administration of sufficient, by mouth in cases of vomiting, i, 42
 as therapeutic agent, i, 519
 in diet in obesity, i, 365
 introduction of, through gall bladder, i, 587
 sufficient intake of, in preparation for operation, i, 16
- Weather, changes in, influencing pain, i, 39
- Wet sheet, i, 530
- Wire cage to protect skin grafts on burn surface, i, 161
- Wolfe's method of skin grafting, ii, 1008
- Work, resumption of, after operation, i, 633
- Worry a cause of sleeplessness, i, 62
- Wound, bursting open of, i, 170
- Wound dressing in appendicitis, ii, 853
 in liver abscess, ii, 826
 in peritonitis, ii, 787

Wound—Cont'd.

- healing, extent of incision as factor in, i, 404
- foreign substances as factor in delaying, i, 431
- general consideration, i, 404
- historical considerations, i, 401
- in cancer of the stomach, ii, 806
- in regions well supplied with blood and lymph, i, 403
- phagocytosis in, i, 405
- principles underlying, i, 401
- tension on, i, 404
- weather and temperature, influence of, i, 404
- Wounds, drainage of, i, 428
 dressing, i, 406
 late treatment of, i, 433
 of the cheek, ii, 676
 of the chin, ii, 676
 of the forehead, ii, 675
 of the lips, ii, 676
 of the nose, ii, 676
 some remote consequences, i, 432
 treatment of, i, 401
- Wright's method of antisepsis, ii, 997

X

- X-ray burns, i, 153

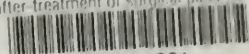
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